REVATIO™

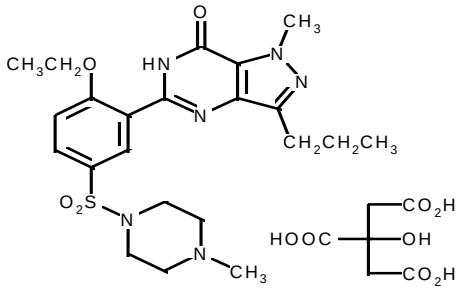
(sildenafil citrate) Tablets, 20 mg

Rx Only

DESCRIPTION

REVATIO™, an oral therapy for pulmonary arterial hypertension, is the citrate salt of sildenafil, a selective inhibitor of cyclic guanosine monophosphate (cGMP)-specific phosphodiesterase type-5 (PDE5).

Sildenafil citrate is designated chemically as 1-[[3-(6,7-dihydro-1-methyl-7-oxo-3-propyl-1*H*-pyrazolo [4,3-*d*] pyrimidin-5-yl)-4-ethoxyphenyl] sulfonyl]-4-methylpiperazine citrate and has the following structural formula:



Sildenafil citrate is a white to off-white crystalline powder with a solubility of 3.5 mg/mL in water and a molecular weight of 666.7. REVATIO (sildenafil citrate) is formulated as white, film-coated round tablets equivalent to 20 mg of sildenafil for oral administration. In addition to the active ingredient, sildenafil citrate, each tablet contains the following inactive ingredients: microcrystalline cellulose, anhydrous dibasic calcium phosphate, croscarmellose sodium, magnesium stearate, hypromellose, titanium dioxide, lactose monohydrate, and triacetin.

CLINICAL PHARMACOLOGY

Mechanism of Action

Sildenafil is an inhibitor of cGMP specific phosphodiesterase type-5 (PDE5) in the smooth muscle of the pulmonary vasculature, where PDE5 is responsible for degradation of cGMP. Sildenafil, therefore, increases cGMP within pulmonary vascular smooth muscle cells resulting in relaxation. In patients with pulmonary hypertension, this can lead to vasodilation of the pulmonary vascular bed and, to a lesser degree, vasodilatation in the systemic circulation.

Studies *in vitro* have shown that sildenafil is selective for PDE5. Its effect is more potent on PDE5 than on other known phosphodiesterases (10-fold for PDE6, >80-fold for PDE1, >700-fold for PDE2, PDE3, PDE4, PDE7, PDE8, PDE9, PDE10, and PDE11). The approximately 4,000-fold selectivity for PDE5 versus PDE3 is important because PDE3 is involved in control of cardiac contractility. Sildenafil is only about 10-fold as potent for PDE5 compared to PDE6,

an enzyme found in the retina and involved in the phototransduction pathway of the retina. This lower selectivity is thought to be the basis for abnormalities related to color vision observed with higher doses or plasma levels (see **Pharmacodynamics**).

In addition to pulmonary vascular smooth muscle and the corpus cavernosum, PDE5 is also found in other tissues including vascular and visceral smooth muscle and in platelets. The inhibition of PDE5 in these tissues by sildenafil may be the basis for the enhanced platelet anti-aggregatory activity of nitric oxide observed *in vitro*, and the mild peripheral arterial-venous dilatation *in vivo*.

Pharmacokinetics and Metabolism

Absorption and Distribution: REVATIO is rapidly absorbed after oral administration, with absolute bioavailability of about 40%. Maximum observed plasma concentrations are reached within 30 to 120 minutes (median 60 minutes) of oral dosing in the fasted state. When REVATIO is taken with a high-fat meal, the rate of absorption is reduced, with a mean delay in T_{max} of 60 minutes and a mean reduction in C_{max} of 29%. The mean steady state volume of distribution (Vss) for sildenafil is 105 L, indicating distribution into the tissues. Sildenafil and its major circulating N-desmethyl metabolite are both approximately 96% bound to plasma proteins. Protein binding is independent of total drug concentrations.

Metabolism and Excretion: Sildenafil is cleared predominantly by the CYP3A4 (major route) and cytochrome P450 2C9 (CYP2C9, minor route) hepatic microsomal isoenzymes. The major circulating metabolite results from N-desmethylation of sildenafil, and is, itself, further metabolized. This metabolite has a phosphodiesterase selectivity profile similar to sildenafil and an *in vitro* potency for PDE5 approximately 50% of the parent drug. In healthy volunteers, plasma concentrations of this metabolite are approximately 40% of those seen for sildenafil, so that the metabolite accounts for about 20% of sildenafil's pharmacologic effects. In patients with pulmonary arterial hypertension, however, the ratio of the metabolite to sildenafil is higher. Both sildenafil and the active metabolite have terminal half-lives of about 4 hours. The concomitant use of potent cytochrome P450 3A4 (CYP3A4) inhibitors (e.g., ritonavir ketoconazole, itraconazole) as well as the nonspecific CYP inhibitor, cimetidine, is associated with increased plasma levels of sildenafil (see **DOSAGE AND ADMINISTRATION and PRECAUTIONS/Drug Interactions)**.

After either oral or intravenous administration, sildenafil is excreted as metabolites predominantly in the feces (approximately 80% of the administered oral dose) and to a lesser extent in the urine (approximately 13% of the administered oral dose).

Pharmacokinetics in Special Populations

Geriatrics: Healthy elderly volunteers (65 years or over) had a reduced clearance of sildenafil, with free plasma concentrations approximately 40% greater than those seen in healthy younger volunteers (18-45 years).

Renal Insufficiency: In volunteers with mild (CLcr =50-80 mL/min) and moderate (CLcr =30-49 mL/min) renal impairment, the pharmacokinetics of a single oral dose of sildenafil (50 mg) was not altered. In volunteers with severe (CLcr <30 mL/min) renal impairment, sildenafil clearance was reduced, resulting in approximately doubling of AUC and C_{max} compared to age-matched volunteers with no renal impairment.

Hepatic Insufficiency: In volunteers with hepatic cirrhosis (Child-Pugh class A and B), sildenafil clearance was reduced, resulting in increases in AUC (84%) and C_{max} (47%) compared to age-matched volunteers with no hepatic impairment. Patients with severe hepatic impairment (Child-Pugh class C) have not been studied.

Population pharmacokinetics
Age, gender, race, and renal and hepatic function were included as factors assessed in the population pharmacokinetic model to evaluate sildenafil pharmacokinetics in pulmonary arterial hypertension patients. The data set available for the population pharmacokinetic evaluation contained a wide range of demographic data and laboratory parameters associated with hepatic and renal function. None of these factors had a statistically significant impact on sildenafil pharmacokinetics in patients with pulmonary hypertension.

In patients with pulmonary hypertension, the average steady-state concentrations were 20-50% higher when compared to those of healthy volunteers. There was also a doubling of C_{min} levels compared to healthy volunteers. Both findings suggest a lower clearance and/or a higher oral bioavailability of sildenafil in patients with pulmonary hypertension compared to healthy volunteers.

Pharmacodynamics
Effects of REVATIO on Blood Pressure: Single oral doses of sildenafil (100 mg) administered to healthy volunteers produced decreases in supine blood pressure (mean maximum decrease in systolic/diastolic blood pressure of 8.4/5.5 mmHg). The decrease in blood pressure was most notable approximately 1-2 hours after dosing, and was not different from placebo at 8 hours. Similar effects on blood pressure were noted with 25 mg, 50 mg and 100 mg doses of sildenafil, therefore the effects are not related to dose or plasma levels within this dosage range. Larger effects were recorded among patients receiving concomitant nitrates (see **CONTRAINDICATIONS**).

Single oral doses of sildenafil up to 100 mg in healthy volunteers produced no clinically relevant effects on ECG. After chronic dosing of 80 mg t.i.d. to patients with pulmonary arterial hypertension, no clinically relevant effects on ECG were reported.

After chronic dosing of 80 mg t.i.d. sildenafil to healthy patients, the largest mean change from baseline in supine systolic and supine diastolic blood pressures was a decrease of 9.0 mmHg and 8.4 mmHg, respectively.

After chronic dosing of 80 mg t.i.d. sildenafil to patients with systemic hypertension, the mean change from baseline in systolic and diastolic blood pressures was a decrease of 9.4 mmHg and 9.1 mmHg, respectively.

After chronic dosing of 80 mg t.i.d. sildenafil to patients with pulmonary arterial hypertension, lesser reductions than above in systolic and diastolic blood pressures were observed (a decrease in both of 2 mmHg).

Effects of REVATIO on Vision: At single oral doses of 100 mg and 200 mg, transient dose-related impairment of color discrimination (blue/green) was detected using the Farnsworth-Munsell 100-hue test, with peak effects near the time of peak plasma levels. This finding is consistent with the inhibition of PDE6, which is involved in phototransduction in the retina. An

evaluation of visual function at doses up to 200 mg revealed no effects of REVATIO on visual acuity, intraocular pressure, or pupillometry.

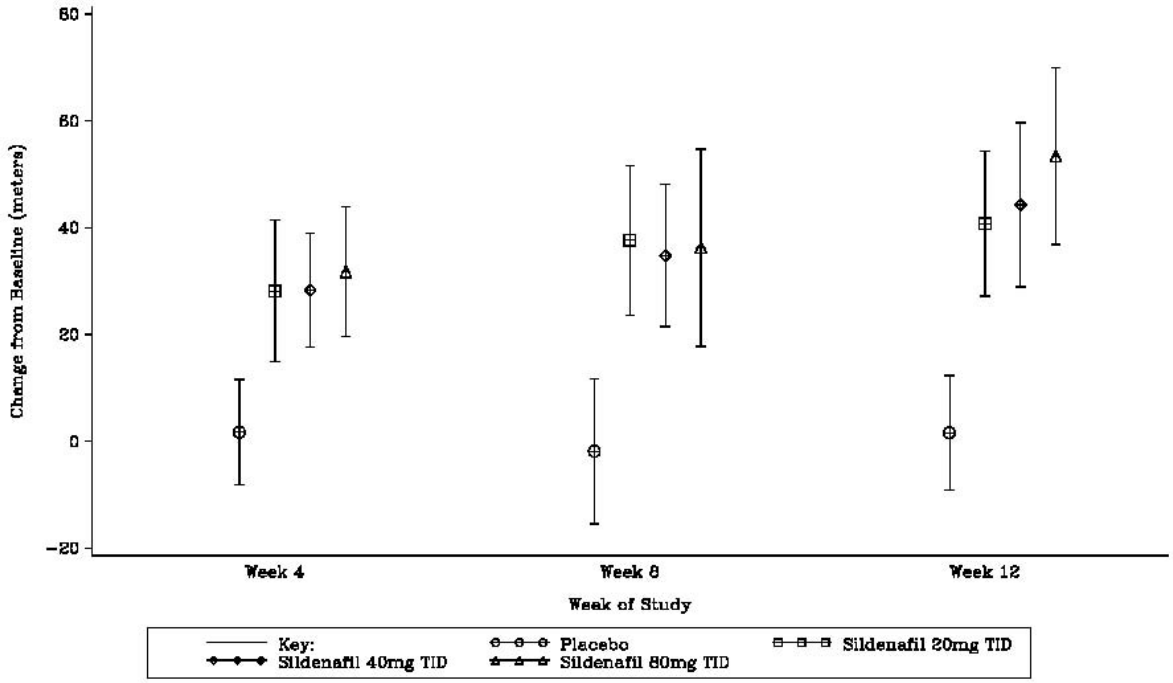
Clinical Studies

A randomized, double-blind, placebo-controlled study was conducted in 277 patients with pulmonary arterial hypertension (PAH, defined as a mean pulmonary artery pressure of ≥25 mmHg at rest with a pulmonary capillary wedge pressure <15 mmHg). Patients were predominantly functional classes II-III. Allowed background therapy included a combination of anticoagulation, digoxin, calcium channel blockers, diuretics or oxygen. The use of prostacyclin analogues, endothelin receptor antagonists, and arginine supplementation were not permitted. Subjects who had failed to respond to bosentan were also excluded. Patients with left ventricular ejection fraction <45% or left ventricular shortening fraction <0.2 also were not studied.

Patients were randomized to receive placebo (n=70) or REVATIO 20 mg (n=69), 40 mg (n=67) or 80 mg (n=71) t.i.d. for a period of 12 weeks. They had either primary pulmonary hypertension (63%), PAH associated with connective tissue disease (30%), or PAH following surgical repair of left-to-right congenital heart lesions (7%). The study population consisted of 25% men and 75% women with a mean age of 49 years (range: 18-81 years) and baseline 6-minute walk test distance between 100 and 450 meters.

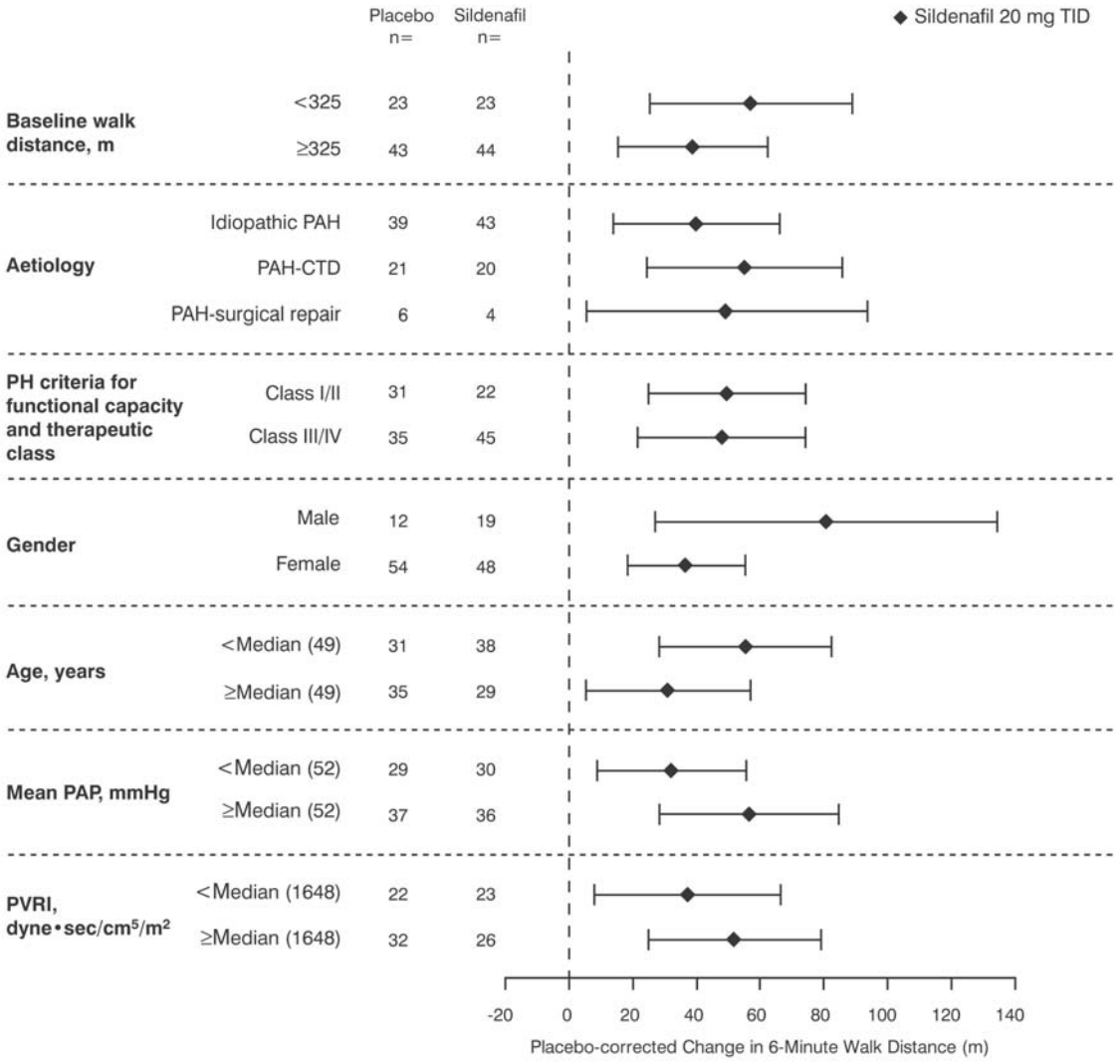
The primary efficacy endpoint was the change from baseline at week 12 in 6-minute walk distance at least 4 hours after the last dose. Placebo-corrected mean increases in walk distance of 45-50 meters were observed with all doses of sildenafil. These increases were highly significantly different from placebo, but the dose groups were not different from each other (Figure 1). The improvement in walk distance was apparent after 4 weeks of treatment and was maintained at week 8 and week 12.

Figure 1: Change from Baseline in 6-Minute Walk Distance (meters): Mean (95% Confidence Interval)



Pre-defined subpopulations in the pivotal study were also evaluated for efficacy, including patient differences in baseline walk distance, disease etiology, functional class, gender, age, and secondary hemodynamic parameters (Figure 2).

Figure 2: Placebo Corrected Change From Baseline in 6-Minute Walk Distance (meters) by study subpopulation: Mean (95% Confidence Interval)



Key: PAH = pulmonary arterial hypertension; CTD = connective tissue disease; PH, pulmonary hypertension; PAP = pulmonary arterial pressure; PVRI = pulmonary vascular resistance index; TID = three times daily.

Patients on all REVATIO doses achieved a statistically significant reduction in mean pulmonary arterial pressure (mPAP) compared to those on placebo. Doses of 20 mg, 40 mg, and 80 mg t.i.d. produced a placebo-corrected decrease in mPAP of -2.7 mmHg, -3.0 mmHg, and -5.1 mmHg, respectively. There was no evidence of a difference in effect between sildenafil 20 mg t.i.d. and the higher doses tested. Data from other hemodynamic parameters can be found in Table 1. The relationship between these effects and improvements in 6-minute walk distance is unknown.

Table 1. Changes from Baseline to Week 12 in Hemodynamic Parameters at Sildenafil 20 mg t.i.d. Dose

PARAMETER [mean (95% CI)]	Placebo (N=65)*	Sildenafil 20 mg t.i.d. (N=65)*
PVR (dyn·s/cm^5)	49 (-54, 153)	-122 (-217, -27)
SVR (dyn·s/cm^5)	-78 (-197, 41)	-167 (-307, -26)
RAP (mmHg)	0.3 (-0.9, 1.5)	-0.8 (-1.9, 0.3)
CO (L/min)	-0.1 (-0.4, 0.2)	0.4 (0.1, 0.7)
HR (beats/min)	-1.3 (-4.1, 1.4)	-3.7 (-5.9, -1.4)

∗The number of patients per treatment group varied slightly for each parameter due to missing assessments.

259 of the 277 treated patients entered a long-term, uncontrolled extension study. At the end of 1 year, 94% of these patients were still alive. Additionally, walk distance and functional class status appeared to be stable in patients taking sildenafil. Without a control group, these data must be interpreted cautiously.

INDICATIONS AND USAGE

REVATIO is indicated for the treatment of pulmonary arterial hypertension (WHO Group I) to improve exercise ability.

The efficacy of REVATIO has not been evaluated in patients currently on bosentan therapy.

CONTRAINDICATIONS

Consistent with its known effects on the nitric oxide/cGMP pathway (see **CLINICAL PHARMACOLOGY**), sildenafil was shown to potentiate the hypotensive effects of nitrates, and its administration to patients who are using organic nitrates, either regularly and/or intermittently, in any form is therefore contraindicated.

REVATIO is contraindicated in patients with a known hypersensitivity to any component of the tablet.

WARNINGS

The concomitant administration of the protease inhibitor ritonavir (a highly potent CYP3A4 inhibitor) substantially increases serum concentrations of sildenafil, therefore co-administration with REVATIO is not recommended (see **Drug Interactions** and **DOSAGE AND ADMINISTRATION**).

REVATIO has vasodilator properties, resulting in mild and transient decreases in blood pressure (see **PRECAUTIONS**). Prior to prescribing REVATIO, physicians should carefully consider whether their patients with certain underlying conditions could be adversely affected by such vasodilatory effects, for example patients with resting hypotension (BP <90/50), or with fluid depletion, severe left ventricular outflow obstruction, or autonomic dysfunction.

Pulmonary vasodilators may significantly worsen the cardiovascular status of patients with pulmonary veno-occlusive disease (PVOD). Since there are no clinical data on administration of REVATIO to patients with veno-occlusive disease, administration of REVATIO to such patients

is not recommended. Should signs of pulmonary edema occur when sildenafil is administered, the possibility of associated PVOD should be considered.

There is no controlled clinical data on the safety or efficacy of REVATIO in the following groups; if prescribed, this should be done with caution:

- Patients who have suffered a myocardial infarction, stroke, or life-threatening arrhythmia within the last 6 months;
- Patients with coronary artery disease causing unstable angina;
- Patients with hypertension (BP >170/110);
- Patients with retinitis pigmentosa (a minority of these patients have genetic disorders of retinal phosphodiesterases).
- Patients currently on bosentan therapy.

PRECAUTIONS

General

Before prescribing REVATIO, it is important to note the following:

- Caution is advised when phosphodiesterase type 5 (PDE5) inhibitors are co-administered with alpha-blockers. PDE5 inhibitors, including sildenafil, and alpha-adrenergic blocking agents are both vasodilators with blood pressure lowering effects. When vasodilators are used in combination, an additive effect on blood pressure may be anticipated. In some patients, concomitant use of these two drug classes can lower blood pressure significantly, leading to symptomatic hypotension. In the sildenafil interaction studies with alpha-blockers (see **Drug Interactions**), cases of symptomatic hypotension consisting of dizziness and lightheadedness were reported. No cases of syncope or fainting were reported during these interaction studies. Consideration should be given to the fact that safety of combined use of PDE5 inhibitors and alpha-blockers may be affected by other variables, including intravascular volume depletion and concomitant use of anti-hypertensive drugs.

- REVATIO should be used with caution in patients with anatomical deformation of the penis (such as angulation, cavernosal fibrosis or Peyronie's disease) or in patients who have conditions, which may predispose them to priapism (such as sickle cell anemia, multiple myeloma or leukemia).

- In humans, sildenafil has no effect on bleeding time when taken alone or with aspirin. *In vitro* studies with human platelets indicate that sildenafil potentiates the anti-aggregatory effect of sodium nitroprusside (a nitric oxide donor). The combination of heparin and sildenafil had an additive effect on bleeding time in the anesthetized rabbit, but this interaction has not been studied in humans.

- The incidence of epistaxis was higher in patients with PAH secondary to CTD (sildenafil 13%, placebo 0%) than in PPH patients (sildenafil 3%, placebo 2%). The incidence of epistaxis was also higher in sildenafil-treated patients with concomitant oral vitamin K antagonist (9% versus 2% in those not treated with concomitant vitamin K antagonist).

- The safety of REVATIO is unknown in patients with bleeding disorders and patients with active peptic ulceration.

Information for Patients
Physicians should discuss with patients the contraindication of REVATIO with regular and/or intermittent use of organic nitrates.

Drug Interactions
In PAH patients, the concomitant use of vitamin K antagonists and sildenafil resulted in a greater incidence of reports of bleeding (primarily epistaxis) versus placebo.

Effects of Other Drugs on REVATIO
***In vitro* studies:** Sildenafil metabolism is principally mediated by the CYP3A4 (major route) and CYP2C9 (minor route) cytochrome P450 isoforms. Therefore, inhibitors of these isoenzymes may reduce sildenafil clearance and inducers of these isoenzymes may increase sildenafil clearance.

***In vivo* studies:** Population pharmacokinetic analysis of clinical trial data indicated a reduction in sildenafil clearance and/or an increase of oral bioavailability when co-administered with CYP3A4 substrates and the combination of CYP3A4 substrates and beta-blockers. These were the only factors with a statistically significant impact on sildenafil pharmacokinetics.

Population data from patients in clinical trials indicated a reduction in sildenafil clearance when it was co-administered with CYP3A4 inhibitors. Sildenafil exposure without concomitant medication is shown to be 5-fold higher at a dose of 80 mg t.i.d. compared to its exposure at a dose of 20 mg t.i.d. This concentration range covers the same increased sildenafil exposure observed in specifically-designed drug interaction studies with CYP3A4 inhibitors (except for potent inhibitors such as ketoconazole, itraconazole, and ritonavir). Cimetidine (800 mg), a nonspecific CYP inhibitor, caused a 56% increase in plasma sildenafil concentrations when co-administered with sildenafil (50 mg) to healthy volunteers. When a single 100 mg dose of sildenafil was co-administered with erythromycin, a CYP3A4 inhibitor, at steady state (500 mg twice daily [b.i.d.] for 5 days), there was a 182% increase in sildenafil systemic exposure (AUC). In a study performed in healthy volunteers, co-administration of the HIV protease inhibitor saquinavir, a CYP3A4 inhibitor, at steady state (1200 mg t.i.d.) with sildenafil (100 mg single dose) resulted in a 140% increase in sildenafil C_{max} and a 210% increase in sildenafil AUC. Stronger CYP3A4 inhibitors will have still greater effects on plasma levels of sildenafil (see **DOSAGE AND ADMINISTRATION**).

In another study in healthy volunteers, co-administration with the HIV protease inhibitor ritonavir, a potent CYP3A4 inhibitor, at steady state (500 mg b.i.d.) with sildenafil (100 mg single dose) resulted in a 300% (4-fold) increase in sildenafil C_{max} and a 1000% (11-fold) increase in sildenafil plasma AUC. At 24 hours, the plasma levels of sildenafil were still approximately 200 ng/mL, compared to approximately 5 ng/mL when sildenafil was dosed alone. This is consistent with ritonavir's marked effects on a broad range of P450 substrates (see **WARNINGS** and **DOSAGE AND ADMINISTRATION**). Although the interaction between other protease inhibitors and REVATIO has not been studied, their concomitant use is expected to increase sildenafil levels.

In a study of healthy male volunteers, co-administration of sildenafil at steady state (80 mg t.i.d.) with the endothelin receptor antagonist bosentan (a moderate inducer of CYP3A4, CYP2C9 and possibly of cytochrome P450 2C19) at steady state (125 mg b.i.d.) resulted in a 63% decrease of sildenafil AUC and a 55% decrease in sildenafil C_{max}. The combination of both drugs did not

lead to clinically significant changes in blood pressure (supine or standing). Concomitant administration of potent CYP3A4 inducers is expected to cause greater decreases in plasma levels of sildenafil.

In drug-drug interaction studies, sildenafil (25 mg, 50 mg, or 100 mg) and the alpha-blocker doxazosin (4 mg or 8 mg) were administered simultaneously to patients with benign prostatic hyperplasia (BPH) stabilized on doxazosin therapy. In these study populations, mean additional reductions of supine systolic and diastolic blood pressure of 7/7 mmHg, 9/5 mmHg, and 8/4 mmHg, respectively, were observed. Mean additional reductions of standing blood pressure of 6/6 mmHg, 11/4 mmHg, and 4/5 mmHg, respectively, were also observed. There were infrequent reports of patients who experienced symptomatic postural hypotension. These reports included dizziness and light-headedness, but not syncope (see **PRECAUTIONS: General**).

Concomitant administration of oral contraceptives (ethinyl estradiol 30 µg and levonorgestrel 150 µg) did not affect the pharmacokinetics of sildenafil.

Concomitant administration of a single 100 mg dose of sildenafil with 10 mg of atorvastatin did not alter the pharmacokinetics of either sildenafil or atorvastatin.

Single doses of antacid (magnesium hydroxide/aluminum hydroxide) did not affect the bioavailability of sildenafil.

Effects of REVATIO on Other Drugs

***In vitro* studies:** Sildenafil is a weak inhibitor of the cytochrome P450 isoforms 1A2, 2C9, 2C19, 2D6, 2E1 and 3A4 (IC50 >150 µM).

***In vivo* studies:** When sildenafil 100 mg oral was co-administered with amlodipine, 5 mg or 10 mg oral, to hypertensive patients, the mean additional reduction on supine blood pressure was 8 mmHg systolic and 7 mmHg diastolic.

No significant interactions were shown with tolbutamide (250 mg) or warfarin (40 mg), both of which are metabolized by CYP2C9.

Sildenafil (50 mg) did not potentiate the increase in bleeding time caused by aspirin (150 mg).

Sildenafil (50 mg) did not potentiate the hypotensive effect of alcohol in healthy volunteers with mean maximum blood alcohol levels of 0.08%.

Sildenafil at steady state (80 mg t.i.d.) resulted in a 50% increase in AUC and a 42% increase in C_{max} of bosentan (125 mg b.i.d.).

In a study of healthy volunteers, sildenafil (100 mg) did not affect the steady-state pharmacokinetics of the HIV protease inhibitors saquinavir and ritonavir, both of which are CYP3A4 substrates.

Sildenafil had no impact on the plasma levels of oral contraceptives (ethinyl estradiol 30 µg and levonorgestrel 150 µg).

Carcinogenesis, Mutagenesis, Impairment of Fertility
Sildenafil was not carcinogenic when administered to rats for up to 24 months at 60 mg/kg/day, a dose resulting in total systemic exposure (AUC) to unbound sildenafil and its major metabolite 33 and 37 times, for male and female rats respectively, the human exposure at the Recommended Human Dose (RHD) of 20 mg t.i.d. Sildenafil was not carcinogenic when administered to male and female mice for up to 21 and 18 months, respectively, at doses up to a maximally tolerated level of 10 mg/kg/day, a dose equivalent to the RHD on a mg/m^2 basis.

Sildenafil was negative in *in vitro* bacterial and Chinese hamster ovary cell assays to detect mutagenicity, and *in vitro* human lymphocytes and *in vivo* mouse micronucleus assays to detect clastogenicity.

There was no impairment of fertility in male or female rats given up to 60 mg sildenafil/kg/day, a dose producing a total systemic exposure (AUC) to unbound sildenafil and its major metabolite of 19 and 38 times for males and females, respectively, the human exposure at the RHD of 20 mg t.i.d.

Pregnancy
Pregnancy Category B. No evidence of teratogenicity, embryotoxicity or fetotoxicity was observed in pregnant rats or rabbits, dosed with 200 mg sildenafil/kg/day during organogenesis, a level that is, on a mg/m^2 basis, 32- and 68-times, respectively, the RHD of 20 mg t.i.d. In a rat pre- and postnatal development study, the no-observed-adverse-effect dose was 30 mg/kg/day (equivalent to 5-times the RHD on a mg/m^2 basis). There are no adequate and well-controlled studies of sildenafil in pregnant women.

Nursing Mothers
It is not known if sildenafil citrate and/or metabolites are excreted in human breast milk. Since many drugs are excreted in human milk, caution should be used when REVATIO is administered to nursing women.

Pediatric Use
Safety and Effectiveness of sildenafil in pediatric pulmonary hypertension patients has not been established.

Geriatric Use
Healthy elderly volunteers (65 years or over) had a reduced clearance of sildenafil, but studies did not include sufficient numbers of subjects to determine whether they respond differently from younger subjects. Other reported clinical experience has not identified differences in response between the elderly and younger pulmonary arterial hypertension patients. In general, dose selection for an elderly patient should be cautious, reflecting the greater frequency of decreased hepatic, renal, or cardiac function, and of concomitant disease or other drug therapy.

ADVERSE REACTIONS

Safety data were obtained from the pivotal study and an open-label extension study in 277 treated patients with pulmonary arterial hypertension. Doses up to 80 mg t.i.d. were studied.

The overall frequency of discontinuation in REVATIO-treated patients at the recommended dose of 20 mg t.i.d. was low (3%) and the same as placebo (3%).

In the pivotal placebo-controlled trial in pulmonary arterial hypertension, the adverse drug reactions that were reported by at least 3% of REVATIO patients treated at the recommended dosage (20 mg t.i.d.) and were more frequent in REVATIO patients than placebo patients, are shown in Table 2. Adverse events were generally transient and mild to moderate in nature.

Table 2. Sildenafil Adverse Events in ≥3% of Patients and More Frequent than Placebo

ADVERSE EVENT %	Placebo (n=70)	Sildenafil 20 mg t.i.d. (n=69)	Placebo Subtracted
Epistaxis	1	9	8
Headache	39	46	7
Dyspepsia	7	13	6
Flushing	4	10	6
Insomnia	1	7	6
Erythema	1	6	5
Dyspnea exacerbated	3	7	4
Rhinitis nos	0	4	4
Diarrhea nos	6	9	3
Myalgia	4	7	3
Pyrexia	3	6	3
Gastritis nos	0	3	3
Sinusitis	0	3	3
Paresthesia	0	3	3

At doses higher than the recommended 20 mg t.i.d. there was a greater incidence of some adverse events including flushing, diarrhea, myalgia and visual disturbances. Visual disturbances were identified as mild and transient, and were predominately color-tinge to vision, but also increased sensitivity to light or blurred vision.

In the pivotal study, the incidence of retinal hemorrhage at the recommended sildenafil 20 mg t.i.d. dose was 1.4% versus 0% placebo and for all sildenafil doses studied was 1.9% versus 0% placebo. The incidence of eye hemorrhage at both the recommended dose and at all doses studied was 1.4% for sildenafil versus 1.4% for placebo. The patients experiencing these events had risk factors for hemorrhage including concurrent anticoagulant therapy.

In post-marketing experience with sildenafil citrate at doses indicated for male erectile dysfunction, serious cardiovascular, cerebrovascular, and vascular events, including myocardial infarction, sudden cardiac death, ventricular arrhythmia, cerebrovascular hemorrhage, transient ischemic attack, hypertension, pulmonary hemorrhage, and subarachnoid and intracerebral hemorrhages have been reported in temporal association with the use of the drug. Most, but not all, of these patients had preexisting cardiovascular risk factors. Many of these events were reported to occur during or shortly after sexual activity, and a few were reported to occur shortly after the use of sildenafil without sexual activity. Others were reported to have occurred hours to days after use concurrent with sexual activity. It is not possible to determine whether these events are related directly to sildenafil citrate, to sexual activity, to the patient's underlying cardiovascular disease, or to a combination of these or other factors.

OVERDOSAGE

In studies with healthy volunteers of single doses up to 800 mg, adverse events were similar to those seen at lower doses but rates were increased.

In cases of overdose, standard supportive measures should be adopted as required. Renal dialysis is not expected to accelerate clearance as sildenafil is highly bound to plasma proteins and it is not eliminated in the urine.

DOSAGE AND ADMINISTRATION

The recommended dose of REVATIO is 20 mg three times a day (t.i.d.). REVATIO tablets should be taken approximately 4-6 hours apart, with or without food. In the clinical trial no greater efficacy was achieved with the use of higher doses. Treatment with doses higher than 20 mg t.i.d. is not recommended. Dosages lower than 20 mg t.i.d. were not tested. Whether dosages lower than 20 mg t.i.d. are effective is not known.

In general, dose selection for elderly patients should be cautious, reflecting the greater frequency of decreased hepatic, renal, or cardiac function, and of concomitant disease or other drug therapy (see **CLINICAL PHARMACOLOGY**)

No dose adjustments are required for renal impaired patients (including severe renal impairment, creatinine clearance <30 mL/min), or for hepatic impaired patients (Child Pugh class A and B).

No dose adjustments are required for the co-administration of REVATIO with erythromycin or saquinavir.

Co-administration of REVATIO with CYP3A4 inducers (including bosentan; and more potent inducers such as barbiturates, carbamazepine, phenytoin, efavirenz, nevirapine, rifampin, rifabutin) may alter plasma levels of either or both medications. Dosage adjustments may be necessary (see **PRECAUTIONS: Drug Interactions**).

Co-administration of potent CYP3A4 inhibitors (e.g., ketoconazole, itraconazole, ritonavir) with REVATIO substantially increases serum concentrations of sildenafil and is therefore not recommended (see **WARNINGS** and **PRECAUTIONS: Drug Interactions**).

Sildenafil was shown to potentiate the hypotensive effects of nitrates and its administration in patients who use nitric oxide donors, or nitrates in any form, is therefore contraindicated.

HOW SUPPLIED

REVATIO (sildenafil citrate) is supplied as white, film-coated, round tablets containing sildenafil citrate equivalent to the nominally indicated amount of sildenafil as follows:

REVATIO Tablets			
Package Configuration	Tablet Strength (mg)	NDC	Engraving on Tablet
Bottle of 90	20 mg	0069-4190-68	RVT20

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

Pfizer Labs
Division of Pfizer Inc, NY, NY 10017

LAB-0313-3 June 2005

ACTOPLUS MET™

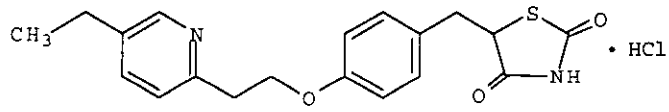
(pioglitazone hydrochloride and metformin hydrochloride tablets)

DESCRIPTION

ACTOPLUS MET™ (pioglitazone hydrochloride and metformin hydrochloride) tablets contain two oral antihyperglycemic drugs used in the management of type 2 diabetes: pioglitazone hydrochloride and metformin hydrochloride. The concomitant use of pioglitazone and metformin has been previously approved based on clinical trials in patients with type 2 diabetes inadequately controlled on metformin. Additional efficacy and safety information about pioglitazone and metformin monotherapies may be found in the prescribing information for each individual drug.

Pioglitazone hydrochloride is an oral antihyperglycemic agent that acts primarily by decreasing insulin resistance. Pioglitazone is used in the management of type 2 diabetes. Pharmacological studies indicate that pioglitazone improves sensitivity to insulin in muscle and adipose tissue and inhibits hepatic gluconeogenesis. Pioglitazone improves glycemic control while reducing circulating insulin levels.

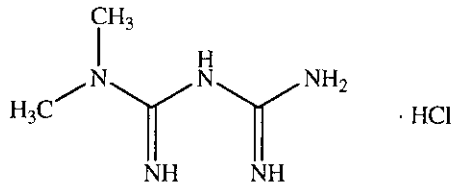
Pioglitazone [(±)-5-[[4-[2-(5-ethyl-2-pyridinyl)ethoxy]phenyl]methyl]-2,4-] thiazolidinedione monohydrochloride belongs to a different chemical class and has a different pharmacological action than the sulfonylureas, biguanides, or the α-glucosidase inhibitors. The molecule contains one asymmetric center, and the synthetic compound is a racemate. The two enantiomers of pioglitazone interconvert in vivo. The structural formula is as shown:



pioglitazone hydrochloride

Pioglitazone hydrochloride is an odorless white crystalline powder that has a molecular formula of $C_{19}H_{20}N_2O_3S$•HCl and a molecular weight of 392.90. It is soluble in *N,N*-dimethylformamide, slightly soluble in anhydrous ethanol, very slightly soluble in acetone and acetonitrile, practically insoluble in water, and insoluble in ether.

Metformin hydrochloride (*N,N* -dimethylimidodicarbonimidic diamide hydrochloride) is not chemically or pharmacologically related to any other classes of oral antihyperglycemic agents. Metformin hydrochloride is a white crystalline powder with a molecular formula of $C_4H_{11}N_5$•HCl and a molecular weight of 165.62. Metformin hydrochloride is freely soluble in water and is practically insoluble in acetone, ether, and chloroform. The pKa of metformin is 12.4. The pH of a 1% aqueous solution of metformin hydrochloride is 6.68. The structural formula is as shown:



metformin hydrochloride

ACTOPLUS MET is available as a tablet for oral administration containing 15 mg pioglitazone hydrochloride (as the base) with 500 mg metformin hydrochloride (15 mg/500 mg) or 15 mg pioglitazone hydrochloride (as the base) with 850 mg metformin hydrochloride (15 mg/850 mg) formulated with the following excipients: povidone USP, microcrystalline cellulose NF, croscarmellose sodium NF, magnesium stearate NF, hypromellose 2910 USP, polyethylene glycol 8000 NF, titanium dioxide USP, and talc USP.

CLINICAL PHARMACOLOGY

Mechanism of Action

ACTOPLUS MET

ACTOPLUS MET combines two antihyperglycemic agents with different mechanisms of action to improve glycemic control in patients with type 2 diabetes: pioglitazone hydrochloride, a member of the thiazolidinedione class, and metformin hydrochloride, a member of the biguanide class. Thiazolidinediones are insulin-sensitizing agents that act primarily by enhancing peripheral glucose utilization, whereas biguanides act primarily by decreasing endogenous hepatic glucose production.

Pioglitazone hydrochloride

Pioglitazone depends on the presence of insulin for its mechanism of action. Pioglitazone decreases insulin resistance in the periphery and in the liver resulting in increased insulin-dependent glucose disposal and decreased hepatic glucose output. Unlike sulfonylureas, pioglitazone is not an insulin secretagogue. Pioglitazone is a potent and highly selective agonist for peroxisome proliferator-activated receptor-gamma (PPARγ). PPAR receptors are found in tissues important for insulin action such as adipose tissue, skeletal muscle, and liver. Activation of PPARγ nuclear receptors modulates the transcription of a number of insulin responsive genes involved in the control of glucose and lipid metabolism.

In animal models of diabetes, pioglitazone reduces the hyperglycemia, hyperinsulinemia, and hypertriglyceridemia characteristic of insulin-resistant states such as type 2 diabetes. The metabolic changes produced by pioglitazone result in increased responsiveness of insulin-dependent tissues and are observed in numerous animal models of insulin resistance.

Since pioglitazone enhances the effects of circulating insulin (by decreasing insulin resistance), it does not lower blood glucose in animal models that lack endogenous insulin.

Metformin hydrochloride
Metformin hydrochloride improves glucose tolerance in patients with type 2 diabetes, lowering both basal and postprandial plasma glucose. Metformin decreases hepatic glucose production, decreases intestinal absorption of glucose and improves insulin sensitivity by increasing peripheral glucose uptake and utilization. Unlike sulfonylureas, metformin does not produce hypoglycemia in either patients with type 2 diabetes or normal subjects (except in special circumstances, see **PRECAUTIONS, General:** ***Metformin hydrochloride***) and does not cause hyperinsulinemia. With metformin therapy, insulin secretion remains unchanged while fasting insulin levels and day-long plasma insulin response may actually decrease.

Pharmacokinetics and Drug Metabolism

Absorption and Bioavailability:
ACTOPLUS MET
In bioequivalence studies of ACTOPLUS MET 15 mg/500 mg and 15 mg/850 mg, the area under the curve (AUC) and maximum concentration (C_{max}) of both the pioglitazone and the metformin component following a single dose of the combination tablet were bioequivalent to ACTOS® 15 mg concomitantly administered with Glucophage® (500 mg or 850 mg respectively) tablets under fasted conditions in healthy subjects (**Table 1**).

Table 1. Mean (SD) Pharmacokinetic Parameters for ACTOPLUS MET™

Regimen	N	AUC(0-inf) (ng· h/mL)	N	C_{max} (ng/mL)	N	T_{max} (h)	N	$T_{1/2}$ (h)
pioglitazone HCl								
15 mg/500 mg ACTOPLUS MET™	51	5984 (1599)	63	585 (198)	63	1.83 (0.93)	51	8.69 (3.86)
15 mg ACTOS® and 500 mg Glucophage®	54	5810 (1472)	63	608 (204)	63	1.75 (0.90)	54	7.90 (3.08)
15 mg/850 mg ACTOPLUS MET™	52	5671 (1585)	60	569 (222)	60	1.89 (0.80)	52	7.19 (1.84)
15 mg ACTOS® and 850 mg Glucophage®	55	5957 (1680)	61	603 (239)	61	2.01 (1.54)	55	7.16 (1.85)
metformin HCl								
15 mg/500 mg ACTOPLUS MET™	59	7783 (2266)	63	1203 (325)	63	2.32 (0.88)	59	8.57 (14.30)
15 mg ACTOS® and 500 mg Glucophage®	59	7599 (2385)	63	1215 (329)	63	2.53 (0.95)	59	6.73 (5.87)
15 mg/850 mg ACTOPLUS MET™	47	11927 (3311)	60	1827 (536)	60	2.41 (0.91)	47	17.56 (20.08)
15 mg ACTOS® and 850 mg Glucophage®	52	11569 (3494)	61	1797 (525)	61	2.26 (0.85)	52	17.01 (18.09)

Administration of ACTOPLUS MET 15 mg/850 mg with food resulted in no change in overall exposure of pioglitazone. With metformin there was no change in AUC; however mean peak serum concentration of metformin was decreased by 28% when administered with food. A delayed time to peak serum concentration was observed for both components (1.9 hours for pioglitazone and 0.8 hours for metformin) under fed conditions. These changes are not likely to be clinically significant.

Pioglitazone hydrochloride
Following oral administration, in the fasting state, pioglitazone is first measurable in serum within 30 minutes, with peak concentrations observed within 2 hours. Food slightly delays the time to peak serum concentration to 3 to 4 hours, but does not alter the extent of absorption.

Metformin hydrochloride
The absolute bioavailability of a 500 mg metformin tablet given under fasting conditions is approximately 50% - 60%. Studies using single oral doses of metformin tablets of 500 mg to 1500 mg, and 850 mg to 2550 mg, indicate that there is a lack of dose proportionality with increasing doses, which is due to decreased absorption rather than an alteration in elimination. Food decreases the extent of and slightly delays the absorption of metformin, as shown by approximately a 40% lower mean peak plasma concentration, a 25% lower AUC in plasma concentration versus time curve, and a 35 minute prolongation of time to peak plasma concentration following administration of a single 850 mg tablet of metformin with food, compared to the same tablet strength administered fasting. The clinical relevance of these decreases is unknown.

Distribution:
Pioglitazone hydrochloride
The mean apparent volume of distribution (V/F) of pioglitazone following single-dose administration is 0.63 ± 0.41 (mean ± SD) L/kg of body weight. Pioglitazone is extensively protein bound (> 99%) in human serum, principally to serum albumin. Pioglitazone also binds to other serum proteins, but with lower affinity. Metabolites M-III and M-IV also are extensively bound (> 98%) to serum albumin.

Metformin hydrochloride
The apparent volume of distribution (V/F) of metformin following single oral doses of 850 mg averaged 654 ± 358 L. Metformin is negligibly bound to plasma proteins. Metformin partitions into erythrocytes, most likely as a function of time. At usual clinical doses and dosing schedules of metformin, steady-state plasma concentrations of metformin are reached within 24 - 48 hours and are generally <1 μg/mL. During controlled clinical trials, maximum metformin plasma levels did not exceed 5 μg/mL, even at maximum doses.

Metabolism, Elimination and Excretion:
Pioglitazone hydrochloride
Pioglitazone is extensively metabolized by hydroxylation and oxidation; the metabolites also partly convert to glucuronide or sulfate conjugates. Metabolites M-II and M-IV (hydroxy derivatives of pioglitazone) and M-III (keto derivative of pioglitazone) are pharmacologically active in animal models of type 2 diabetes. In addition to pioglitazone, M-III and M-IV are the principal drug-related species found in human serum following multiple dosing. At steady-state, in both healthy volunteers and in patients with type 2 diabetes, pioglitazone comprises approximately 30% to 50% of the total peak serum concentrations and 20% to 25% of the total AUC.

In vitro data demonstrate that multiple CYP isoforms are involved in the metabolism of pioglitazone. The cytochrome P450 isoforms involved are CYP2C8 and, to a lesser degree, CYP3A4 with additional contributions from a variety of other isoforms including the mainly extrahepatic CYP1A1. In vivo studies of pioglitazone in combination with P450 inhibitors and substrates have been performed (see **PRECAUTIONS, Drug Interactions,** *Pioglitazone hydrochloride*). Urinary 6ß-hydroxycortisol/cortisol ratios measured in patients treated with pioglitazone showed that pioglitazone is not a strong CYP3A4 enzyme inducer.

Following oral administration, approximately 15% to 30% of the pioglitazone dose is recovered in the urine. Renal elimination of pioglitazone is negligible and the drug is excreted primarily as metabolites and their conjugates. It is presumed that most of the oral dose is excreted into the bile either unchanged or as metabolites and eliminated in the feces.

The mean serum half-life of pioglitazone and total pioglitazone ranges from 3 to 7 hours and 16 to 24 hours, respectively. Pioglitazone has an apparent clearance, CL/F, calculated to be 5 to 7 L/hr.

Metformin hydrochloride
Intravenous single-dose studies in normal subjects demonstrate that metformin is excreted unchanged in the urine and does not undergo hepatic metabolism (no metabolites have been identified in humans) nor biliary excretion. Renal clearance is approximately 3.5 times greater than creatinine clearance which indicates that tubular secretion is the major route of metformin elimination. Following oral administration, approximately 90% of the absorbed drug is eliminated via the renal route within the first 24 hours, with a plasma elimination half-life of approximately 6.2 hours. In blood, the elimination half-life is approximately 17.6 hours, suggesting that the erythrocyte mass may be a compartment of distribution.

Special Populations

Renal Insufficiency:
Pioglitazone hydrochloride
The serum elimination half-life of pioglitazone, M-III and M-IV remains unchanged in patients with moderate (creatinine clearance 30 to 60 mL/min) to severe (creatinine clearance < 30 mL/min) renal impairment when compared to normal subjects.

Metformin hydrochloride
In patients with decreased renal function (based on creatinine clearance), the plasma and blood half-life of metformin is prolonged and the renal clearance is decreased in proportion to the decrease in creatinine clearance (see **CONTRAINDICATIONS** and **WARNINGS, *Metformin hydrochloride***, also see GLUCOPHAGE[1] prescribing information, CLINICAL PHARMACOLOGY, Pharmacokinetics). Since metformin is contraindicated in patients with renal impairment, ACTOPLUS MET is also contraindicated in these patients.

Hepatic Insufficiency:
Pioglitazone hydrochloride
Compared with normal controls, subjects with impaired hepatic function (Child-Pugh Grade B/C) have an approximate 45% reduction in pioglitazone and total pioglitazone mean peak concentrations but no change in the mean AUC values.

Therapy with ACTOPLUS MET should not be initiated if the patient exhibits clinical evidence of active liver disease or serum transaminase levels (ALT) exceed 2.5 times the upper limit of normal (see **PRECAUTIONS, General: *Pioglitazone hydrochloride***).

Metformin hydrochloride
No pharmacokinetic studies of metformin have been conducted in subjects with hepatic insufficiency.

Elderly:
Pioglitazone hydrochloride
In healthy elderly subjects, peak serum concentrations of pioglitazone and total pioglitazone are not significantly different, but AUC values are slightly higher and the terminal half-life values slightly longer than for younger subjects. These changes were not of a magnitude that would be considered clinically relevant.

Metformin hydrochloride
Limited data from controlled pharmacokinetic studies of metformin in healthy elderly subjects suggest that total plasma clearance is decreased, the half-life is prolonged, and C_{max} is increased, compared to healthy young subjects. From these data, it appears that the change in metformin pharmacokinetics with aging is primarily accounted for by a change in renal function (see GLUCOPHAGE[1] prescribing information, CLINICAL PHARMACOLOGY, Special Populations, Geriatrics).

ACTOPLUS MET treatment should not be initiated in patients ≥ 80 years of age unless measurement of creatinine clearance demonstrates that renal function is not reduced (see **WARNINGS, *Metformin hydrochloride*** and **DOSAGE AND ADMINISTRATION**; also see GLUCOPHAGE[1] prescribing information).

Pediatrics:
Pioglitazone hydrochloride
Pharmacokinetic data in the pediatric population are not available.

Metformin hydrochloride
After administration of a single oral metformin 500 mg tablet with food, geometric mean metformin C_{max} and AUC differed less than 5% between pediatric type 2 diabetic patients (12 to 16 years of age) and gender- and weight-matched healthy adults (20 to 45 years of age), and all with normal renal function.

Gender:
Pioglitazone hydrochloride
As monotherapy and in combination with sulfonylurea, metformin, or insulin, pioglitazone improved glycemic control in both males and females. The mean C_{max} and AUC values were increased 20% to 60% in females. In controlled clinical trials, hemoglobin A1C (A1C) decreases from baseline were generally greater for females than for males (average mean difference in A1C 0.5%). Since therapy should be individualized for each patient to achieve glycemic control, no dose adjustment is recommended based on gender alone.

Metformin hydrochloride
Metformin pharmacokinetic parameters did not differ significantly between normal subjects and patients with type 2 diabetes when analyzed according to gender (males = 19, females = 16).

Similarly, in controlled clinical studies in patients with type 2 diabetes, the antihyperglycemic effect of metformin was comparable in males and females.

Ethnicity:
Pioglitazone hydrochloride
Pharmacokinetic data among various ethnic groups are not available.

Metformin hydrochloride
No studies of metformin pharmacokinetic parameters according to race have been performed. In controlled clinical studies of metformin in patients with type 2 diabetes, the antihyperglycemic effect was comparable in whites (n=249), blacks (n=51), and Hispanics (n=24).

Drug-Drug Interactions
Co-administration of a single dose of metformin (1000 mg) and pioglitazone after 7 days of pioglitazone (45 mg) did not alter the pharmacokinetics of the single dose of metformin. Specific pharmacokinetic drug interaction studies with ACTOPLUS MET have not been performed, although such studies have been conducted with the individual pioglitazone and metformin components.

Pioglitazone hydrochloride
The following drugs were studied in healthy volunteers with co-administration of pioglitazone 45 mg once daily. Results are listed below:

Oral Contraceptives: Co-administration of pioglitazone (45 mg once daily) and an oral contraceptive (1 mg norethindrone plus 0.035 mg ethinyl estradiol once daily) for 21 days, resulted in 11% and 11-14% decrease in ethinyl estradiol AUC (0-24h) and C_{max} respectively. There were no significant changes in norethindrone AUC (0-24h) and C_{max}. In view of the high variability of ethinyl estradiol pharmacokinetics, the clinical significance of this finding is unknown.

Midazolam: Administration of pioglitazone for 15 days followed by a single 7.5 mg dose of midazolam syrup resulted in a 26% reduction in midazolam C_{max} and AUC.

Nifedipine ER: Co-administration of pioglitazone for 7 days with 30 mg nifedipine ER administered orally once daily for 4 days to male and female volunteers resulted in a ratio of least square mean (90% CI) values for unchanged nifedipine of 0.83 (0.73 - 0.95) for C_{max} and 0.88 (0.80 - 0.96) for AUC. In view of the high variability of nifedipine pharmacokinetics, the clinical significance of this finding is unknown.

Ketoconazole: Co-administration of pioglitazone for 7 days with ketoconazole 200 mg administered twice daily resulted in a ratio of least square mean (90% CI) values for unchanged pioglitazone of 1.14 (1.06 - 1.23) for C_{max}, 1.34 (1.26 - 1.41) for AUC and 1.87 (1.71 - 2.04) for C_{min}.

Atorvastatin Calcium: Co-administration of pioglitazone for 7 days with atorvastatin calcium (LIPITOR®) 80 mg once daily resulted in a ratio of least square mean (90% CI) values for unchanged pioglitazone of 0.69 (0.57 - 0.85) for C_{max}, 0.76 (0.65 - 0.88) for AUC and 0.96 (0.87 - 1.05) for C_{min}. For unchanged atorvastatin the ratio of least square mean (90% CI) values were 0.77 (0.66 - 0.90) for C_{max}, 0.86 (0.78 - 0.94) for AUC and 0.92 (0.82 - 1.02) for C_{min}.

Cytochrome P450: See **PRECAUTIONS, Drug Interactions, *Pioglitazone hydrochloride***

In other drug-drug interaction studies, pioglitazone had no significant effect on the pharmacokinetics of fexofenadine, glipizide, digoxin, warfarin, ranitidine HCl or theophylline.

Metformin hydrochloride
See **PRECAUTIONS, Drug Interactions, *Metformin hydrochloride***

Pharmacodynamics and Clinical Effects
Pioglitazone hydrochloride
Clinical studies demonstrate that pioglitazone improves insulin sensitivity in insulin-resistant patients. Pioglitazone enhances cellular responsiveness to insulin, increases insulin-dependent glucose disposal, improves hepatic sensitivity to insulin, and improves dysfunctional glucose homeostasis. In patients with type 2 diabetes, the decreased insulin resistance produced by pioglitazone results in lower plasma glucose concentrations, lower plasma insulin levels, and lower A1C values. Based on results from an open-label extension study, the glucose-lowering effects of pioglitazone appear to persist for at least one year. In controlled clinical studies, pioglitazone in combination with metformin had an additive effect on glycemic control.

Patients with lipid abnormalities were included in placebo-controlled monotherapy clinical studies with pioglitazone. Overall, patients treated with pioglitazone had mean decreases in triglycerides, mean increases in HDL cholesterol, and no consistent mean changes in LDL cholesterol and total cholesterol compared to the placebo group. A similar pattern of results was seen in 16-week and 24-week combination therapy studies of pioglitazone with metformin.

Clinical Studies
There have been no clinical efficacy studies conducted with ACTOPLUS MET. However, the efficacy and safety of the separate components have been previously established and the co-administration of the separate components has been evaluated for efficacy and safety in two clinical studies. These clinical studies established an added benefit of pioglitazone in patients with inadequately controlled type 2 diabetes while on metformin therapy. Bioequivalence of ACTOPLUS MET with co-administered pioglitazone and metformin tablets was demonstrated for both ACTOPLUS MET strengths (see **CLINICAL PHARMACOLOGY, Pharmacokinetics and Drug Metabolism**).

Clinical Trials of Pioglitazone Add-on Therapy in Patients Not Adequately Controlled on Metformin

Two treatment-randomized, controlled clinical studies in patients with type 2 diabetes were conducted to evaluate the safety and efficacy of pioglitazone plus metformin. Both studies included patients receiving metformin, either alone or in combination with another antihyperglycemic agent, who had inadequate glycemic control. All other antihyperglycemic agents were discontinued prior to starting study treatment. In the first study, 328 patients received either 30 mg of pioglitazone or placebo once daily for 16 weeks in addition to their established metformin regimen. In the second study, 827 patients received either 30 mg or 45 mg of pioglitazone once daily for 24 weeks in addition to their established metformin regimen.

In the first study, the addition of pioglitazone 30 mg once daily to metformin treatment significantly reduced the mean A1C by 0.83% and the mean FPG by 37.7 mg/dL at Week 16 from that observed with metformin alone. In the second study, the mean reductions from Baseline at Week 24 in A1C were 0.80% and 1.01% for the 30 mg and 45 mg doses, respectively. Mean reductions from Baseline in FPG were 38.2 mg/dL and 50.7 mg/dL, respectively. Based on these reductions in A1C and FPG (**Table 2**), the addition of pioglitazone to metformin resulted in significant improvements in glycemic control irrespective of the metformin dose.

Table 2. Glycemic Parameters in 16-Week and 24-Week Pioglitazone Hydrochloride + Metformin Hydrochloride Combination Studies

Parameter	Placebo + metformin	Pioglitazone 30 mg + metformin
16-Week Study		
A1C (%)	**N=153**	**N=161**
Baseline mean	9.77	9.92
Mean change from Baseline at 16 Weeks	0.19	-0.64*, †
Difference in change from placebo + metformin		-0.83
Responder rate (%) (a)	**21.6**	**54.0**
FPG (mg/dL)	**N=157**	**N=165**
Baseline mean	259.9	254.4
Mean change from Baseline at 16 Weeks	-5.2	-42.8*, †
Difference in change from placebo + metformin		-37.7
Responder rate (%) (b)	**23.6**	**59.4**
Parameter	**Pioglitazone 30 mg + metformin**	**Pioglitazone 45 mg + metformin**
24-Week Study		
A1C (%)	**N=400**	**N=398**
Baseline mean	9.88	9.81
Mean Change from Baseline at 24 Weeks	-0.80*	-1.01*
Responder rate (%) (a)	**55.8**	**63.3**
FPG (mg/dL)	**N=398**	**N=399**
Baseline mean	232.5	232.1
Mean Change from Baseline at 24 Weeks	-38.2*	-50.7*, ‡
Responder rate (%) (b)	**52.3**	**63.7**

* significant change from Baseline $p \leq 0.050$.
† significant difference from placebo plus metformin, $p \leq 0.050$.
‡ significant difference from 30 mg pioglitazone, $p \leq 0.050$.
(a) patients who achieved an A1C ≤ 6.1% or ≥ 0.6% decrease from Baseline.
(b) patients who achieved a decrease in FPG by ≥ 30 mg/dL.

INDICATIONS AND USAGE

ACTOPLUS MET is indicated as an adjunct to diet and exercise to improve glycemic control in patients with type 2 diabetes who are already treated with a combination of pioglitazone and metformin or whose diabetes is not adequately controlled with metformin alone, or for those patients who have initially responded to pioglitazone alone and require additional glycemic control.

Management of type 2 diabetes should also include nutritional counseling, weight reduction as needed, and exercise. These efforts are important not only in the primary treatment of type 2 diabetes, but also to maintain the efficacy of drug therapy.

CONTRAINDICATIONS

ACTOPLUS MET (pioglitazone hydrochloride and metformin hydrochloride) is contraindicated in patients with:

1. Renal disease or renal dysfunction (e.g., as suggested by serum creatinine levels ≥ 1.5 mg/dL [males], ≥ 1.4 mg/dL [females], or abnormal creatinine clearance) which may also result from conditions such as cardiovascular collapse (shock), acute myocardial infarction, and septicemia (see **WARNINGS, *Metformin hydrochloride*** and **PRECAUTIONS, General: *Metformin hydrochloride***).

2. Known hypersensitivity to pioglitazone, metformin or any other component of ACTOPLUS MET.

3. Acute or chronic metabolic acidosis, including diabetic ketoacidosis, with or without coma. Diabetic ketoacidosis should be treated with insulin.

ACTOPLUS MET should be temporarily discontinued in patients undergoing radiologic studies involving intravascular administration of iodinated contrast materials, because use of such products may result in acute alteration of renal function (see **PRECAUTIONS, General: *Metformin hydrochloride***).

WARNINGS

Metformin hydrochloride

Lactic Acidosis: **Lactic acidosis is a rare, but serious, metabolic complication that can occur due to metformin accumulation during treatment with ACTOPLUS MET (pioglitazone hydrochloride and metformin hydrochloride tablets); when it occurs, it is fatal in approximately 50% of cases. Lactic acidosis may also occur in association with a number of pathophysiologic conditions, including diabetes mellitus, and whenever there is significant tissue hypoperfusion and hypoxemia. Lactic acidosis is characterized by elevated blood lactate levels (> 5 mmol/L), decreased blood pH, electrolyte disturbances with an increased anion gap, and an increased lactate/pyruvate ratio. When metformin is implicated as the cause of lactic acidosis, metformin plasma levels > 5 μg/mL are generally found.**

The reported incidence of lactic acidosis in patients receiving metformin hydrochloride is very low (approximately 0.03 cases/1000 patient-years, with approximately 0.015 fatal cases/1000 patient-years). In more than 20,000 patient-years exposure to metformin in clinical trials, there were no reports of lactic acidosis. Reported cases have occurred primarily in diabetic patients with significant renal insufficiency, including both intrinsic renal disease and renal hypoperfusion, often in the setting of multiple concomitant medical/surgical problems and multiple concomitant medications. Patients with congestive heart failure requiring pharmacologic management, in particular those with unstable or acute congestive heart failure who are at risk of hypoperfusion and hypoxemia, are at increased risk of lactic acidosis. The risk of lactic acidosis increases with the degree of renal dysfunction and the patient's age. The risk of lactic acidosis may, therefore, be significantly decreased by regular monitoring of renal function in patients taking metformin and by use of the minimum effective dose of metformin. In particular, treatment of the elderly should be accompanied by careful monitoring of renal function. Metformin treatment should not be initiated in patients ≥ 80 years of age unless measurement of creatinine clearance demonstrates that renal function is not reduced, as these patients are more susceptible to developing lactic acidosis. In addition, metformin should be promptly withheld in the presence of any condition associated with hypoxemia, dehydration, or sepsis. Because impaired hepatic function may significantly limit the ability to clear lactate, metformin should generally be avoided in patients with clinical or laboratory evidence of hepatic disease. Patients should be cautioned against excessive alcohol intake, either acute or chronic, when taking metformin, since alcohol potentiates the effects of metformin hydrochloride on lactate metabolism. In addition, metformin should be temporarily discontinued prior to any intravascular radiocontrast study and for any surgical procedure (see PRECAUTIONS, General: *Metformin hydrochloride*).

The onset of lactic acidosis often is subtle, and accompanied only by nonspecific symptoms such as malaise, myalgias, respiratory distress, increasing somnolence, and nonspecific abdominal distress. There may be associated hypothermia, hypotension, and resistant bradyarrhythmias with more marked acidosis. The patient and the patient's physician must be aware of the possible importance of such symptoms and the patient should be instructed to notify the physician immediately if they occur (see PRECAUTIONS, General: *Metformin hydrochloride*). Metformin should be withdrawn

until the situation is clarified. Serum electrolytes, ketones, blood glucose, and, if indicated, blood pH, lactate levels, and even blood metformin levels may be useful. Once a patient is stabilized on any dose level of metformin, gastrointestinal symptoms, which are common during initiation of therapy, are unlikely to be drug related. Later occurrence of gastrointestinal symptoms could be due to lactic acidosis or other serious disease.

Levels of fasting venous plasma lactate above the upper limit of normal but less than 5 mmol/L in patients taking metformin do not necessarily indicate impending lactic acidosis and may be explainable by other mechanisms, such as poorly controlled diabetes or obesity, vigorous physical activity, or technical problems in sample handling (see PRECAUTIONS, General: *Metformin hydrochloride*).

Lactic acidosis should be suspected in any diabetic patient with metabolic acidosis lacking evidence of ketoacidosis (ketonuria and ketonemia).

Lactic acidosis is a medical emergency that must be treated in a hospital setting. In a patient with lactic acidosis who is taking metformin, the drug should be discontinued immediately and general supportive measures promptly instituted. Because metformin hydrochloride is dialyzable (with a clearance of up to 170 mL/min under good hemodynamic conditions), prompt hemodialysis is recommended to correct the acidosis and remove the accumulated metformin. Such management often results in prompt reversal of symptoms and recovery (see CONTRAINDICATIONS and PRECAUTIONS, General: *Metformin hydrochloride*).

Pioglitazone hydrochloride

Cardiac Failure and Other Cardiac Effects: Pioglitazone, like other thiazolidinediones, can cause fluid retention when used alone or in combination with other antihyperglycemic agents, including insulin. Fluid retention may lead to or exacerbate heart failure. Patients should be observed for signs and symptoms of heart failure (see **Information for Patients**). ACTOS should be discontinued if any deterioration in cardiac status occurs. Patients with New York Heart Association (NYHA) Class III and IV cardiac status were not studied during pre-approval clinical trials; ACTOS is not recommended in these patients (see **PRECAUTIONS, General: *Pioglitazone hydrochloride,*** Cardiovascular).

In one 16-week U.S. double-blind, placebo-controlled clinical trial involving 566 patients with type 2 diabetes, pioglitazone at doses of 15 mg and 30 mg in combination with insulin was compared to insulin therapy alone. This trial included patients with long-standing diabetes and a high prevalence of pre-existing medical conditions as follows: arterial hypertension (57.2%), peripheral neuropathy (22.6%), coronary heart disease (19.6%), retinopathy (13.1%), myocardial infarction (8.8%), vascular disease (6.4%), angina pectoris (4.4%), stroke and/or transient ischemic attack (4.1%), and congestive heart failure (2.3%).

In this study two of the 191 patients receiving 15 mg pioglitazone plus insulin (1.1%) and two of the 188 patients receiving 30 mg pioglitazone plus insulin (1.1%) developed congestive heart failure compared with none of the 187 patients on insulin therapy alone. All four of these patients had previous histories of cardiovascular conditions including coronary artery disease, previous CABG procedures, and myocardial infarction. In a 24-week dose-controlled study in

which pioglitazone was co-administered with insulin, 0.3% of patients (1/345) on 30 mg and 0.9% (3/345) of patients on 45 mg reported CHF as a serious adverse event.

Analysis of data from these studies did not identify specific factors that predict increased risk of congestive heart failure on combination therapy with insulin.

In type 2 diabetes and congestive heart failure (systolic dysfunction)
A 24-week post-marketing safety study was performed to compare ACTOS (n=262) to glyburide (n=256) in uncontrolled diabetic patients (mean A1C 8.8% at baseline) with NYHA Class II and III heart failure and ejection fraction less than 40% (mean EF 30% at baseline). Over the course of the study, overnight hospitalization for congestive heart failure was reported in 9.9% of patients on ACTOS compared to 4.7% of patients on glyburide with a treatment difference observed from 6 weeks. This adverse event associated with ACTOS was more marked in patients using insulin at baseline and in patients over 64 years of age. No difference in cardiovascular mortality between the treatment groups was observed.

ACTOS should be initiated at the lowest approved dose if it is prescribed for patients with type 2 diabetes and systolic heart failure (NYHA Class II). If subsequent dose escalation is necessary, the dose should be increased gradually only after several months of treatment with careful monitoring for weight gain, edema, or signs and symptoms of CHF exacerbation.

PRECAUTIONS

General: *Pioglitazone hydrochloride*
Pioglitazone exerts its antihyperglycemic effect only in the presence of insulin. Therefore, ACTOPLUS MET should not be used in patients with type 1 diabetes or for the treatment of diabetic ketoacidosis.

Hypoglycemia: Patients receiving pioglitazone in combination with insulin or oral hypoglycemic agents may be at risk for hypoglycemia, and a reduction in the dose of the concomitant agent may be necessary.

Cardiovascular: In U.S. placebo-controlled clinical trials that excluded patients with New York Heart Association (NYHA) Class III and IV cardiac status, the incidence of serious cardiac adverse events related to volume expansion was not increased in patients treated with pioglitazone as monotherapy or in combination with sulfonylureas or metformin vs. placebo-treated patients. In insulin combination studies, a small number of patients with a history of previously existing cardiac disease developed congestive heart failure when treated with pioglitazone in combination with insulin. Patients with NYHA Class III and IV cardiac status were not studied in pre-approval pioglitazone clinical trials. Pioglitazone is not indicated in patients with NYHA Class III or IV cardiac status.

In postmarketing experience with pioglitazone, cases of congestive heart failure have been reported in patients both with and without previously known heart disease.

Edema: In all U.S. clinical trials with pioglitazone, edema was reported more frequently in patients treated with pioglitazone than in placebo-treated patients and appears to be dose related (see **ADVERSE REACTIONS**). In postmarketing experience, reports of initiation or worsening of edema have been received. ACTOPLUS MET should be used with caution in patients with edema.

Weight Gain: Dose related weight gain was observed with pioglitazone alone and in combination with other hypoglycemic agents (**Table 3**). The mechanism of weight gain is unclear but probably involves a combination of fluid retention and fat accumulation.

Table 3. Weight Changes (kg) from Baseline during Double-Blind Clinical Trials with Pioglitazone

		Control Group	**pioglitazone 15 mg**	**pioglitazone 30 mg**	**pioglitazone 45 mg**
		Median ($25^{th}/75^{th}$ percentile)	Median ($25^{th}/75^{th}$ percentile)	Median ($25^{th}/75^{th}$ percentile)	Median ($25^{th}/75^{th}$ percentile)
Monotherapy		-1.4 (-2.7/0.0) n=256	0.9 (-0.5/3.4) n = 79	1.0 (-0.9/3.4) n=188	2.6 (0.2/5.4) n = 79
Combination Therapy	Sulfonylurea	-0.5 (-1.8/0.7) n=187	2.0 (0.2/3.2) n=183	3.1 (1.1/5.4) n=528	4.1 (1.8/7.3) n=333
	Metformin	-1.4 (-3.2/0.3) n=160	N/A	0.9 (-0.3/3.2) n=567	1.8 (-0.9/5.0) n=407
	Insulin	0.2 (-1.4/1.4) n=182	2.3 (0.5/4.3) n=190	3.3 (0.9/6.3) n=522	4.1 (1.4/6.8) n=338

Note: Trial durations of 16 to 24 weeks

Ovulation: Therapy with pioglitazone, like other thiazolidinediones, may result in ovulation in some premenopausal anovulatory women. Thus, adequate contraception in premenopausal women should be recommended while taking ACTOPLUS MET. This possible effect has not been investigated in clinical studies so the frequency of this occurrence is not known.

Hematologic: Across all clinical studies with pioglitazone, mean hemoglobin values declined by 2% to 4% in patients treated with pioglitazone. These changes primarily occurred within the first 4 to 12 weeks of therapy and remained relatively constant thereafter. These changes may be related to increased plasma volume and have rarely been associated with any significant hematologic clinical effects (see **ADVERSE REACTIONS, Laboratory Abnormalities**). ACTOPLUS MET may cause decreases in hemoglobin and hematocrit.

Hepatic Effects: In pre-approval clinical studies worldwide, over 4500 subjects were treated with pioglitazone. In U.S. clinical studies, over 4700 patients with type 2 diabetes received pioglitazone. There was no evidence of drug-induced hepatotoxicity or elevation of ALT levels in the clinical studies.

During pre-approval placebo-controlled clinical trials in the U.S., a total of 4 of 1526 (0.26%) patients treated with pioglitazone and 2 of 793 (0.25%) placebo-treated patients had ALT values ≥ 3 times the upper limit of normal. The ALT elevations in patients treated with pioglitazone were reversible and were not clearly related to therapy with pioglitazone.

In postmarketing experience with pioglitazone, reports of hepatitis and of hepatic enzyme elevations to 3 or more times the upper limit of normal have been received. Very rarely, these reports have involved hepatic failure with and without fatal outcome, although causality has not been established.

Pending the availability of the results of additional large, long-term controlled clinical trials and additional postmarketing safety data on pioglitazone, it is recommended that patients treated with ACTOPLUS MET undergo periodic monitoring of liver enzymes.

Serum ALT (alanine aminotransferase) levels should be evaluated prior to the initiation of therapy with ACTOPLUS MET in all patients and periodically thereafter per the clinical judgment of the health care professional. Liver function tests should also be obtained for patients if symptoms suggestive of hepatic dysfunction occur, e.g., nausea, vomiting, abdominal pain, fatigue, anorexia, or dark urine. The decision whether to continue the patient on therapy with ACTOPLUS MET should be guided by clinical judgment pending laboratory evaluations. If jaundice is observed, drug therapy should be discontinued.

Therapy with ACTOPLUS MET should not be initiated if the patient exhibits clinical evidence of active liver disease or the ALT levels exceed 2.5 times the upper limit of normal. Patients with mildly elevated liver enzymes (ALT levels at 1 to 2.5 times the upper limit of normal) at baseline or any time during therapy with ACTOPLUS MET should be evaluated to determine the cause of the liver enzyme elevation. Initiation or continuation of therapy with ACTOPLUS MET in patients with mildly elevated liver enzymes should proceed with caution and include appropriate clinical follow-up which may include more frequent liver enzyme monitoring. If serum transaminase levels are increased (ALT > 2.5 times the upper limit of normal), liver function tests should be evaluated more frequently until the levels return to normal or pretreatment values. If ALT levels exceed 3 times the upper limit of normal, the test should be repeated as soon as possible. If ALT levels remain > 3 times the upper limit of normal or if the patient is jaundiced, ACTOPLUS MET therapy should be discontinued.

General: ***Metformin hydrochloride***
Monitoring of renal function: Metformin is known to be substantially excreted by the kidney, and the risk of metformin accumulation and lactic acidosis increases with the degree of impairment of renal function. Thus, patients with serum creatinine levels above the upper limit of normal for their age should not receive ACTOPLUS MET. In patients with advanced age, ACTOPLUS MET should be carefully titrated to establish the minimum dose for adequate glycemic effect, because aging is associated with reduced renal function. In elderly patients, particularly those ≥ 80 years of age, renal function should be monitored regularly and, generally, ACTOPLUS MET should not be titrated to the maximum dose of the metformin component (see **WARNINGS,** ***Metformin hydrochloride*** and **DOSAGE AND ADMINISTRATION**).

Before initiation of therapy with ACTOPLUS MET and at least annually thereafter, renal function should be assessed and verified as normal. In patients in whom development of renal dysfunction is anticipated, renal function should be assessed more frequently and ACTOPLUS MET discontinued if evidence of renal impairment is present.

Use of concomitant medications that may affect renal function or metformin disposition: Concomitant medication(s) that may affect renal function or result in significant hemodynamic change or may interfere with the disposition of metformin, such as cationic drugs that are eliminated by renal tubular secretion (see **PRECAUTIONS, Drug Interactions, *Metformin hydrochloride***), should be used with caution.

Radiologic studies involving the use of intravascular iodinated contrast materials (for example, intravenous urogram, intravenous cholangiography, angiography, and computed tomography (CT) scans with intravascular contrast materials): Intravascular contrast studies with iodinated materials can lead to acute alteration of renal function and have been associated with lactic acidosis in patients receiving metformin (see **CONTRAINDICATIONS**). Therefore, in patients in whom any such study is planned, ACTOPLUS MET should be temporarily discontinued at the time of or prior to the procedure, and withheld for 48 hours subsequent to the procedure and reinstituted only after renal function has been re-evaluated and found to be normal.

Hypoxic states: Cardiovascular collapse (shock) from whatever cause, acute congestive heart failure, acute myocardial infarction and other conditions characterized by hypoxemia have been associated with lactic acidosis and may also cause prerenal azotemia. When such events occur in patients receiving ACTOPLUS MET therapy, the drug should be promptly discontinued.

Surgical procedures: Use of ACTOPLUS MET should be temporarily suspended for any surgical procedure (except minor procedures not associated with restricted intake of food and fluids) and should not be restarted until the patient's oral intake has resumed and renal function has been evaluated as normal.

Alcohol intake: Alcohol is known to potentiate the effect of metformin on lactate metabolism. Patients, therefore, should be warned against excessive alcohol intake, acute or chronic, while receiving ACTOPLUS MET.

Impaired hepatic function: Since impaired hepatic function has been associated with some cases of lactic acidosis, ACTOPLUS MET should generally be avoided in patients with clinical or laboratory evidence of hepatic disease.

Vitamin B_{12} levels: In controlled clinical trials of metformin at 29 weeks' duration, a decrease to subnormal levels of previously normal serum vitamin B_{12} levels, without clinical manifestations, was observed in approximately 7% of patients. Such decrease, possibly due to interference with B_{12} absorption from the B_{12}-intrinsic factor complex, is, however, very rarely associated with anemia and appears to be rapidly reversible with discontinuation of metformin or vitamin B_{12} supplementation. Measurement of hematologic parameters on an annual basis is advised in patients on ACTOPLUS MET and any apparent abnormalities should be appropriately investigated and managed (see **PRECAUTIONS, General: *Metformin hydrochloride*** and **Laboratory Tests**). Certain individuals (those with inadequate vitamin B_{12} or calcium intake or

absorption) appear to be predisposed to developing subnormal vitamin B_{12} levels. In these patients, routine serum vitamin B_{12} measurements at two- to three-year intervals may be useful.

Change in clinical status of patients with previously controlled type 2 diabetes: A patient with type 2 diabetes previously well-controlled on ACTOPLUS MET who develops laboratory abnormalities or clinical illness (especially vague and poorly defined illness) should be evaluated promptly for evidence of ketoacidosis or lactic acidosis. Evaluation should include serum electrolytes and ketones, blood glucose and, if indicated, blood pH, lactate, pyruvate and metformin levels. If acidosis of either form occurs, ACTOPLUS MET must be stopped immediately and other appropriate corrective measures initiated (see **WARNINGS, *Metformin hydrochloride***).

Hypoglycemia: Hypoglycemia does not occur in patients receiving metformin alone under usual circumstances of use, but could occur when caloric intake is deficient, when strenuous exercise is not compensated by caloric supplementation, or during concomitant use with hypoglycemic agents (such as sulfonylureas or insulin) or ethanol. Elderly, debilitated or malnourished patients and those with adrenal or pituitary insufficiency or alcohol intoxication are particularly susceptible to hypoglycemic effects. Hypoglycemia may be difficult to recognize in the elderly and in people who are taking beta-adrenergic blocking drugs.

Loss of control of blood glucose: When a patient stabilized on any diabetic regimen is exposed to stress such as fever, trauma, infection, or surgery, a temporary loss of glycemic control may occur. At such times, it may be necessary to withhold ACTOPLUS MET and temporarily administer insulin. ACTOPLUS MET may be reinstituted after the acute episode is resolved.

Laboratory Tests
FPG and A1C measurements should be performed periodically to monitor glycemic control and therapeutic response to ACTOPLUS MET.

Liver enzyme monitoring is recommended prior to initiation of therapy with ACTOPLUS MET in all patients and periodically thereafter per the clinical judgment of the health care professional (see **PRECAUTIONS, General: *Pioglitazone hydrochloride*** and **ADVERSE REACTIONS,** Serum Transaminase Levels).

Initial and periodic monitoring of hematologic parameters (e.g., hemoglobin/hematocrit and red blood cell indices) and renal function (serum creatinine) should be performed, at least on an annual basis. While megaloblastic anemia has rarely been seen with metformin therapy, if this is suspected, Vitamin B_{12} deficiency should be excluded.

Information for Patients
Patients should be instructed regarding the importance of adhering to dietary instructions, a regular exercise program, and regular testing of blood glucose and A1C. During periods of stress such as fever, trauma, infection, or surgery, medication requirements may change and patients should be reminded to seek medical advice promptly.

The risks of lactic acidosis, its symptoms and conditions that predispose to its development, as noted in the WARNINGS, *Metformin hydrochloride* and PRECAUTIONS, General:

Metformin hydrochloride sections, should be explained to patients. Patients should be advised to discontinue ACTOPLUS MET immediately and to promptly notify their health care professional if unexplained hyperventilation, myalgia, malaise, unusual somnolence or other nonspecific symptoms occur. Gastrointestinal symptoms are common during initiation of metformin treatment and may occur during initiation of ACTOPLUS MET therapy; however, patients should consult with their physician if they develop unexplained symptoms. Although gastrointestinal symptoms that occur after stabilization are unlikely to be drug related, such an occurrence of symptoms should be evaluated to determine if it may be due to lactic acidosis or other serious disease.

Patients should be counseled against excessive alcohol intake, either acute or chronic, while receiving ACTOPLUS MET.

Patients who experience an unusually rapid increase in weight or edema or who develop shortness of breath or other symptoms of heart failure while on ACTOPLUS MET should immediately report these symptoms to their physician.

Patients should be told that blood tests for liver function will be performed prior to the start of therapy and periodically thereafter per the clinical judgment of the health care professional. Patients should be told to seek immediate medical advice for unexplained nausea, vomiting, abdominal pain, fatigue, anorexia, or dark urine.

Patients should be informed about the importance of regular testing of renal function and hematologic parameters when receiving treatment with ACTOPLUS MET.

Therapy with a thiazolidinedione, which is the active pioglitazone component of the ACTOPLUS MET tablet, may result in ovulation in some premenopausal anovulatory women. As a result, these patients may be at an increased risk for pregnancy while taking ACTOPLUS MET. Thus, adequate contraception in premenopausal women should be recommended. This possible effect has not been investigated in clinical studies so the frequency of this occurrence is not known.

Combination antihyperglycemic therapy may cause hypoglycemia. When initiating ACTOPLUS MET, the risks of hypoglycemia, its symptoms and treatment, and conditions that predispose to its development should be explained to patients.

Patients should be told to take ACTOPLUS MET as prescribed and instructed that any change in dosing should only be done if directed by their physician.

Drug Interactions

Pioglitazone hydrochloride

In vivo drug-drug interaction studies have suggested that pioglitazone may be a weak inducer of CYP450 isoform 3A4 substrate.

Metformin hydrochloride
Furosemide: A single-dose, metformin-furosemide drug interaction study in healthy subjects demonstrated that pharmacokinetic parameters of both compounds were affected by co-administration. Furosemide increased the metformin plasma and blood C_{max} by 22% and blood AUC by 15%, without any significant change in metformin renal clearance. When administered with metformin, the C_{max} and AUC of furosemide were 31% and 12% smaller, respectively, than when administered alone and the terminal half-life was decreased by 32%, without any significant change in furosemide renal clearance. No information is available about the interaction of metformin and furosemide when co-administered chronically.

Nifedipine: A single-dose, metformin-nifedipine drug interaction study in normal healthy volunteers demonstrated that co-administration of nifedipine increased plasma metformin C_{max} and AUC by 20% and 9%, respectively and increased the amount excreted in the urine. T_{max} and half-life were unaffected. Nifedipine appears to enhance the absorption of metformin. Metformin had minimal effects on nifedipine.

Cationic Drugs: Cationic drugs (e.g., amiloride, digoxin, morphine, procainamide, quinidine, quinine, ranitidine, triamterene, trimethoprim, and vancomycin) that are eliminated by renal tubular secretion theoretically have the potential for interaction with metformin by competing for common renal tubular transport systems. Such interaction between metformin and oral cimetidine has been observed in normal healthy volunteers in both single- and multiple-dose, metformin-cimetidine drug interaction studies with a 60% increase in peak metformin plasma and whole blood concentrations and a 40% increase in plasma and whole blood metformin AUC. There was no change in elimination half-life in the single-dose study. Metformin had no effect on cimetidine pharmacokinetics. Although such interactions remain theoretical (except for cimetidine), careful patient monitoring and dose adjustment of ACTOPLUS MET and/or the interfering drug is recommended in patients who are taking cationic medications that are excreted via the proximal renal tubular secretory system.

Other: Certain drugs tend to produce hyperglycemia and may lead to loss of glycemic control. These drugs include thiazides and other diuretics, corticosteroids, phenothiazines, thyroid products, estrogens, oral contraceptives, phenytoin, nicotinic acid, sympathomimetics, calcium channel blocking drugs, and isoniazid. When such drugs are administered to a patient receiving ACTOPLUS MET, the patient should be closely observed to maintain adequate glycemic control.

In healthy volunteers, the pharmacokinetics of metformin and propranolol and metformin and ibuprofen were not affected when co-administered in single-dose interaction studies.

Metformin is negligibly bound to plasma proteins and is therefore, less likely to interact with highly protein-bound drugs such as salicylates, sulfonamides, chloramphenicol and probenecid.

Carcinogenesis, Mutagenesis, Impairment of Fertility

ACTOPLUS MET

No animal studies have been conducted with ACTOPLUS MET. The following data are based on findings in studies performed with pioglitazone or metformin individually.

Pioglitazone hydrochloride

A two-year carcinogenicity study was conducted in male and female rats at oral doses up to 63 mg/kg (approximately 14 times the maximum recommended human oral dose of 45 mg based on mg/m^2). Drug-induced tumors were not observed in any organ except for the urinary bladder. Benign and/or malignant transitional cell neoplasms were observed in male rats at 4 mg/kg/day and above (approximately equal to the maximum recommended human oral dose based on mg/m^2). A two-year carcinogenicity study was conducted in male and female mice at oral doses up to 100 mg/kg/day (approximately 11 times the maximum recommended human oral dose based on mg/m^2). No drug-induced tumors were observed in any organ. Urinary tract tumors have been reported in rodents taking experimental drugs with dual PPAR α/γ activity; however, pioglitazone is a selective agonist for PPARγ.

During prospective evaluation of urinary cytology involving more than 1800 patients receiving pioglitazone in clinical trials up to one year in duration, no new cases of bladder tumors were identified. Occasionally, abnormal urinary cytology results indicating possible malignancy were observed in both patients treated with pioglitazone (0.72%) and patients treated with placebo (0.88%).

Pioglitazone HCl was not mutagenic in a battery of genetic toxicology studies, including the Ames bacterial assay, a mammalian cell forward gene mutation assay (CHO/HPRT and AS52/XPRT), an in vitro cytogenetics assay using CHL cells, an unscheduled DNA synthesis assay, and an in vivo micronucleus assay.

No adverse effects upon fertility were observed in male and female rats at oral doses up to 40 mg/kg pioglitazone HCl daily prior to and throughout mating and gestation (approximately 9 times the maximum recommended human oral dose based on mg/m^2).

Metformin hydrochloride

Long-term carcinogenicity studies have been performed in rats (dosing duration of 104 weeks) and mice (dosing duration of 91 weeks) at doses up to and including 900 mg/kg/day and 1500 mg/kg/day, respectively. These doses are both approximately four times a human daily dose of 2000 mg of the metformin component of ACTOPLUS MET based on body surface area comparisons. No evidence of carcinogenicity with metformin was found in either male or female mice. Similarly, there was no tumorigenic potential observed with metformin in male rats. There was, however, an increased incidence of benign stromal uterine polyps in female rats treated with 900 mg/kg/day.

There was no evidence of mutagenic potential of metformin in the following *in vitro* tests: Ames test (*S. typhimurium*), gene mutation test (mouse lymphoma cells), or chromosomal

aberrations test (human lymphocytes). Results in the *in vivo* mouse micronucleus test were also negative.

Fertility of male or female rats was unaffected by metformin when administered at doses as high as 600 mg/kg/day, which is approximately three times the maximum recommended human daily dose of the metformin component of ACTOPLUS MET based on body surface area comparisons.

Animal Toxicology

Pioglitazone hydrochloride

Heart enlargement has been observed in mice (100 mg/kg), rats (4 mg/kg and above) and dogs (3 mg/kg) treated orally with the pioglitazone HCl component of ACTOPLUS MET (approximately 11, 1, and 2 times the maximum recommended human oral dose for mice, rats, and dogs, respectively, based on mg/m^2). In a one-year rat study, drug-related early death due to apparent heart dysfunction occurred at an oral dose of 160 mg/kg/day (approximately 35 times the maximum recommended human oral dose based on mg/m^2). Heart enlargement was seen in a 13-week study in monkeys at oral doses of 8.9 mg/kg and above (approximately 4 times the maximum recommended human oral dose based on mg/m^2), but not in a 52-week study at oral doses up to 32 mg/kg (approximately 13 times the maximum recommended human oral dose based on mg/m^2).

Pregnancy: Pregnancy Category C

ACTOPLUS MET

Because current information strongly suggests that abnormal blood glucose levels during pregnancy are associated with a higher incidence of congenital anomalies, as well as increased neonatal morbidity and mortality, most experts recommend that insulin be used during pregnancy to maintain blood glucose levels as close to normal as possible. ACTOPLUS MET should not be used during pregnancy unless the potential benefit justifies the potential risk to the fetus.

There are no adequate and well-controlled studies in pregnant women with ACTOPLUS MET or its individual components. No animal studies have been conducted with the combined products in ACTOPLUS MET. The following data are based on findings in studies performed with pioglitazone or metformin individually.

Pioglitazone hydrochloride

Pioglitazone was not teratogenic in rats at oral doses up to 80 mg/kg or in rabbits given up to 160 mg/kg during organogenesis (approximately 17 and 40 times the maximum recommended human oral dose based on mg/m^2, respectively). Delayed parturition and embryotoxicity (as evidenced by increased postimplantation losses, delayed development and reduced fetal weights) were observed in rats at oral doses of 40 mg/kg/day and above (approximately 10 times the maximum recommended human oral dose based on mg/m^2). No functional or behavioral toxicity was observed in offspring of rats. In rabbits, embryotoxicity was observed at an oral dose of 160 mg/kg (approximately 40 times the maximum recommended human oral dose based on mg/m^2). Delayed postnatal development, attributed to decreased body weight, was observed in

offspring of rats at oral doses of 10 mg/kg and above during late gestation and lactation periods (approximately 2 times the maximum recommended human oral dose based on mg/m^2).

Metformin hydrochloride
Metformin was not teratogenic in rats and rabbits at doses up to 600 mg/kg/day. This represents an exposure of about two and six times a human daily dose of 2000 mg based on body surface area comparisons for rats and rabbits, respectively. Determination of fetal concentrations demonstrated a partial placental barrier to metformin.

Nursing Mothers
No studies have been conducted with the combined components of ACTOPLUS MET. In studies performed with the individual components, both pioglitazone and metformin are secreted in the milk of lactating rats. It is not known whether pioglitazone and/or metformin is secreted in human milk. Because many drugs are excreted in human milk, ACTOPLUS MET should not be administered to a breastfeeding woman. If ACTOPLUS MET is discontinued, and if diet alone is inadequate for controlling blood glucose, insulin therapy should be considered.

Pediatric Use
Safety and effectiveness of ACTOPLUS MET in pediatric patients have not been established.

Elderly Use
Pioglitazone hydrochloride
Approximately 500 patients in placebo-controlled clinical trials of pioglitazone were 65 and over. No significant differences in effectiveness and safety were observed between these patients and younger patients.

Metformin hydrochloride
Controlled clinical studies of metformin did not include sufficient numbers of elderly patients to determine whether they respond differently from younger patients, although other reported clinical experience has not identified differences in responses between the elderly and young patients. Metformin is known to be substantially excreted by the kidney and because the risk of serious adverse reactions to the drug is greater in patients with impaired renal function, ACTOPLUS MET should only be used in patients with normal renal function (see **CONTRAINDICATIONS**, **WARNINGS,** ***Metformin hydrochloride*** and **CLINICAL PHARMACOLOGY, Special Populations**). Because aging is associated with reduced renal function, ACTOPLUS MET should be used with caution as age increases. Care should be taken in dose selection and should be based on careful and regular monitoring of renal function. Generally, elderly patients should not be titrated to the maximum dose of ACTOPLUS MET (see **WARNINGS,** ***Metformin hydrochloride*** and **DOSAGE AND ADMINISTRATION**).

ADVERSE REACTIONS
The most common adverse events reported in at least 5% of patients in the controlled 16-week clinical trial between placebo plus metformin and pioglitazone 30 mg plus metformin were upper respiratory tract infection (15.6% and 15.5%), diarrhea (6.3% and 4.8%), combined edema/peripheral edema (2.5% and 6.0%) and headache (1.9% and 6.0%), respectively.

The incidence and type of adverse events reported in at least 5% of patients in any combined treatment group from the 24-week study comparing pioglitazone 30 mg plus metformin and pioglitazone 45 mg plus metformin are shown in Table 4; the rate of adverse events resulting in study discontinuation between the two treatment groups was 7.8%and 7.7%, respectively.

Table 4. Adverse Events That Occurred in ≥ 5% of Patients in Any Treatment Group During the 24-Week Study

Adverse Event Preferred Term	Pioglitazone 30 mg + metformin N=411 n (%)	Pioglitazone 45 mg + metformin N=416 n (%)
Upper Respiratory Tract Infection	51 (12.4)	56 (13.5)
Diarrhea	24 (5.8)	20 (4.8)
Nausea	24 (5.8)	15 (3.6)
Headache	19 (4.6)	22 (5.3)
Urinary Tract Infection	24 (5.8)	22 (5.3)
Sinusitis	18 (4.4)	21 (5.0)
Dizziness	22 (5.4)	20 (4.8)
Edema Lower Limb	12 (2.9)	47 (11.3)
Weight Increased	12 (2.9)	28 (6.7)

Most clinical adverse events were similar between groups treated with pioglitazone in combination with metformin and those treated with pioglitazone monotherapy. Other adverse events reported in at least 5% of patients in controlled clinical trials between placebo and pioglitazone monotherapy included myalgia (2.7% and 5.4%), tooth disorder (2.3% and 5.3%), diabetes mellitus aggravated (8.1% and 5.1%) and pharyngitis (0.8% and 5.1%), respectively.

In U.S. double-blind studies, anemia was reported in ≤ 2% of patients treated with pioglitazone plus metformin (see **PRECAUTIONS, General:** ***Pioglitazone hydrochloride***).

In monotherapy studies, edema was reported for 4.8% of patients treated with pioglitazone versus 1.2% of placebo-treated patients. Most of these events were considered mild or moderate in intensity (**see PRECAUTIONS, General:** ***Pioglitazone hydrochloride***).

Laboratory Abnormalities

Hematologic: Pioglitazone may cause decreases in hemoglobin and hematocrit. The fall in hemoglobin and hematocrit with pioglitazone appears to be dose related. Across all clinical studies, mean hemoglobin values declined by 2% to 4% in patients treated with pioglitazone. These changes generally occurred within the first 4 to 12 weeks of therapy and remained relatively stable thereafter. These changes may be related to increased plasma volume associated with pioglitazone therapy and have rarely been associated with any significant hematologic clinical effects (see **PRECAUTIONS, General:** ***Pioglitazone hydrochloride***).

In controlled clinical trials of metformin at 29 weeks' duration, a decrease to subnormal levels of previously normal serum vitamin B_{12} levels, without clinical manifestations, was observed in approximately 7% of patients. Such decrease, possibly due to interference with B_{12} absorption

from the B_{12}-intrinsic factor complex, is, however, very rarely associated with anemia and appears to be rapidly reversible with discontinuation of metformin or vitamin B_{12} supplementation (see **PRECAUTIONS, General:** ***Metformin hydrochloride***).

Serum Transaminase Levels: During all clinical studies in the U.S., 14 of 4780 (0.30%) patients treated with pioglitazone had ALT values ≥ 3 times the upper limit of normal during treatment. All patients with follow-up values had reversible elevations in ALT. In the population of patients treated with pioglitazone, mean values for bilirubin, AST, ALT, alkaline phosphatase, and GGT were decreased at the final visit compared with baseline. Fewer than 0.9% of patients treated with pioglitazone were withdrawn from clinical trials in the U.S. due to abnormal liver function tests.

In pre-approval clinical trials, there were no cases of idiosyncratic drug reactions leading to hepatic failure (see **PRECAUTIONS, General:** ***Pioglitazone hydrochloride***).

CPK Levels: During required laboratory testing in clinical trials with pioglitazone, sporadic, transient elevations in creatine phosphokinase levels (CPK) were observed. An isolated elevation to greater than 10 times the upper limit of normal was noted in 9 patients (values of 2150 to 11400 IU/L). Six of these patients continued to receive pioglitazone, two patients had completed receiving study medication at the time of the elevated value and one patient discontinued study medication due to the elevation. These elevations resolved without any apparent clinical sequelae. The relationship of these events to pioglitazone therapy is unknown.

OVERDOSAGE

Pioglitazone hydrochloride

During controlled clinical trials, one case of overdose with pioglitazone was reported. A male patient took 120 mg per day for four days, then 180 mg per day for seven days. The patient denied any clinical symptoms during this period.

In the event of overdosage, appropriate supportive treatment should be initiated according to patient's clinical signs and symptoms.

Metformin hydrochloride

Overdose of metformin hydrochloride has occurred, including ingestion of amounts greater than 50 grams. Hypoglycemia was reported in approximately 10% of cases, but no causal association with metformin hydrochloride has been established. Lactic acidosis has been reported in approximately 32% of metformin overdose cases (see **WARNINGS,** ***Metformin hydrochloride***). Metformin is dialyzable with a clearance of up to 170 mL/min under good hemodynamic conditions. Therefore, hemodialysis may be useful for removal of accumulated metformin from patients in whom metformin overdosage is suspected.

DOSAGE AND ADMINISTRATION

General

The use of antihyperglycemic therapy in the management of type 2 diabetes should be individualized on the basis of effectiveness and tolerability while not exceeding the maximum recommended daily dose of pioglitazone 45 mg and metformin 2550 mg.

Dosage Recommendations

Selecting the starting dose of ACTOPLUS MET should be based on the patient's current regimen of pioglitazone and/or metformin. ACTOPLUS MET should be given in divided daily doses with meals to reduce the gastrointestinal side effects associated with metformin.

Starting dose for patients inadequately controlled on metformin monotherapy

Based on the usual starting dose of pioglitazone (15-30 mg daily), ACTOPLUS MET may be initiated at either the 15 mg/500 mg or 15 mg/850 mg tablet strength once or twice daily, and gradually titrated after assessing adequacy of therapeutic response.

Starting dose for patients who initially responded to pioglitazone monotherapy and require additional glycemic control

Based on the usual starting doses of metformin (500 mg twice daily or 850 mg daily), ACTOPLUS MET may be initiated at either the 15 mg/500 mg twice daily or 15 mg/850 mg tablet strength once daily, and gradually titrated after assessing adequacy of therapeutic response.

Starting dose for patients switching from combination therapy of pioglitazone plus metformin as separate tablets

ACTOPLUS MET may be initiated with either the 15 mg/500 mg or 15 mg /850 mg tablet strengths based on the dose of pioglitazone and metformin already being taken.

No studies have been performed specifically examining the safety and efficacy of ACTOPLUS MET in patients previously treated with other oral hypoglycemic agents and switched to ACTOPLUS MET. Any change in therapy of type 2 diabetes should be undertaken with care and appropriate monitoring as changes in glycemic control can occur.

Sufficient time should be given to assess adequacy of therapeutic response. Ideally, the response to therapy should be evaluated using A1C, which is a better indicator of long-term glycemic control than FPG alone. A1C reflects glycemia over the past two to three months. In clinical use, it is recommended that patients be treated with ACTOPLUS MET for a period of time adequate to evaluate change in A1C (8-12 weeks) unless glycemic control as measured by FPG deteriorates.

Special Patient Populations

ACTOPLUS MET is not recommended for use in pregnancy or for use in pediatric patients.

The initial and maintenance dosing of ACTOPLUS MET should be conservative in patients with advanced age, due to the potential for decreased renal function in this population. Any dosage adjustment should be based on a careful assessment of renal function. Generally, elderly,

debilitated, and malnourished patients should not be titrated to the maximum dose of ACTOPLUS MET. Monitoring of renal function is necessary to aid in prevention of metformin-associated lactic acidosis, particularly in the elderly (see **WARNINGS, *Metformin hydrochloride*** and **PRECAUTIONS, General: *Metformin hydrochloride***).

Therapy with ACTOPLUS MET should not be initiated if the patient exhibits clinical evidence of active liver disease or increased serum transaminase levels (ALT greater than 2.5 times the upper limit of normal) at start of therapy (see **PRECAUTIONS, General: *Pioglitazone hydrochloride*** and **CLINICAL PHARMACOLOGY, Special Populations, Hepatic Insufficiency**). Liver enzyme monitoring is recommended in all patients prior to initiation of therapy with ACTOPLUS MET and periodically thereafter (see **PRECAUTIONS, General: *Pioglitazone hydrochloride*** and **PRECAUTIONS, Laboratory Tests**).

Maximum Recommended Dose
ACTOPLUS MET tablets are available as a 15 mg pioglitazone plus 500 mg metformin or a 15 mg pioglitazone plus 850 mg metformin formulation for oral administration. The maximum recommended dose for pioglitazone is 45 mg daily. The maximum recommended daily dose for metformin is 2550 mg in adults.

HOW SUPPLIED
ACTOPLUS MET is available in 15 mg pioglitazone hydrochloride (as the base)/500 mg metformin hydrochloride and 15 mg pioglitazone hydrochloride (as the base)/850 mg metformin hydrochloride tablets as follows:

15 mg/500 mg tablet: white to off-white, oblong, film-coated tablet with "4833M" on one side, and "15/500" on the other, available in:
Bottles of 60 NDC 64764-155-60
Bottles of 180 NDC 64764-155-18

15 mg/850 mg tablet: white to off-white, oblong, film-coated tablet with "4833M" on one side, and "15/850" on the other, available in:
Bottles of 60 NDC 64764-158-60
Bottles of 180 NDC 64764-158-18

STORAGE
Store at 25°C (77°F); excursions permitted to 15-30°C (59-86°F) [see USP Controlled Room Temperature]. Keep container tightly closed, and protect from moisture and humidity.

Rx only

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Patient Information

FOSAMAX PLUS D™ (FOSS-ah-max PLUS D) (alendronate sodium/cholecalciferol) Tablets

Read the patient information before you start taking FOSAMAX PLUS D*. Also, read the leaflet each time you refill your prescription, just in case anything has changed. This leaflet does not take the place of discussions with your doctor about your medical condition or treatment. You and your doctor should discuss FOSAMAX PLUS D when you start taking your medicine and at regular checkups.

What is the most important information I should know about FOSAMAX PLUS D?

- **You must take FOSAMAX PLUS D exactly as directed to help make sure it works and to help lower the chance of harmful side effects.**
- **Choose the day of the week that best fits your schedule. Every week, take 1 FOSAMAX PLUS D tablet on your chosen day.**
- **After getting up for the day and before taking your first food, drink, or other medicine, swallow your FOSAMAX PLUS D tablet with a full glass (6-8 oz) of plain water only.**

  Do **not** take FOSAMAX PLUS D with:

  Mineral water
  Coffee or tea
  Juice

- **Do not chew or suck on a tablet of FOSAMAX PLUS D.**
- **After swallowing your FOSAMAX PLUS D tablet, do not lie down – stay fully upright (sitting, standing, or walking) for at least 30 minutes. Do not lie down until after your first food of the day.** This will help the FOSAMAX PLUS D tablet reach your stomach quickly and help reduce the chance that FOSAMAX PLUS D might irritate your esophagus, the tube that connects your mouth with your stomach.
- **After swallowing your FOSAMAX PLUS D tablet, wait at least 30 minutes before taking your first food, drink, or other medicine of the day,** including antacids, calcium, and other supplements and vitamins. FOSAMAX PLUS D is effective only if it is taken when your stomach is empty.
- **Do not take FOSAMAX PLUS D at bedtime or before getting up for the day.**
- **If you have chest pain, new or worsening heartburn, or have trouble or pain when you swallow, stop taking FOSAMAX PLUS D and call your doctor.**

Some patients may need more vitamin D than is in FOSAMAX PLUS D. Your doctor may recommend additional vitamin D supplementation.

What is FOSAMAX PLUS D?

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FOSAMAX PLUS D is a prescription medicine that contains alendronate sodium and vitamin D_3 (cholecalciferol) as the active ingredients. FOSAMAX PLUS D provides a week's worth of vitamin D_3 (2800 IU). The Daily Value is 400 IU.

FOSAMAX PLUS D is used for:

- The treatment of osteoporosis (thinning of bone) in women after menopause. It reduces the chance of having a hip or spinal fracture (break).

- Treatment to increase bone mass in men with osteoporosis.

Improvement in bone density may be seen as early as 3 months after you start taking FOSAMAX PLUS D. For FOSAMAX PLUS D to continue to work, you need to keep taking it.

FOSAMAX PLUS D is not a hormone.

There is more information about osteoporosis and vitamin D at the end of this leaflet.

Who should not take FOSAMAX PLUS D?

Do not take FOSAMAX PLUS D if you:

- Have certain problems with your esophagus, the tube that connects your mouth with your stomach
- Cannot stand or sit upright for at least 30 minutes
- Have low levels of calcium in your blood
- Have severe kidney disease
- Are allergic to FOSAMAX PLUS D or any of its ingredients. A list of ingredients is at the end of this leaflet.

If you are pregnant or nursing, talk to your doctor about whether taking FOSAMAX PLUS D is right for you based on possible risk to you and your child.

Talk to your doctor if you have or have had:

- Problems with swallowing
- Stomach or digestive problems
- Sarcoidosis, leukemia, lymphoma
- Other medical problems you have or had in the past

Also tell your doctor about all medicines you take, including prescription and non-prescription medicines, vitamins, and herbal supplements.

Know the medicines you take. Keep a list of them and show it to your doctor and pharmacist each time you see your doctor or get a new medicine.

How should I take FOSAMAX PLUS D?

See "What is the most important information I should know about FOSAMAX PLUS D?" for important information about how to take the medicine and to help make sure it works for you. **In addition, follow these instructions:**

- Take 1 dose of FOSAMAX PLUS D **once a week**.

- Choose the day of the week that best fits your schedule. Every week take 1 tablet of FOSAMAX PLUS D on your chosen day.

- After getting up for the day and before taking your first food, drink, or other medicine, swallow your FOSAMAX PLUS D tablet with a full glass (6-8 oz) of plain water only.

- It is important that you keep taking FOSAMAX PLUS D for as long as your doctor says to take it. For FOSAMAX PLUS D to continue to work, you need to keep taking it.

- If you miss a dose, take only 1 FOSAMAX PLUS D tablet on the morning after you remember. Do not take 2 tablets on the same day. Continue your usual schedule of 1 FOSAMAX PLUS D tablet once a week on your chosen day.

- If you think you took more than the prescribed dose of FOSAMAX PLUS D, drink a full glass of milk and contact your local poison control center or emergency room right away. Do not try to vomit. Do not lie down.

What should I avoid while taking FOSAMAX PLUS D?

- **Do not eat, drink, or take other medicines or supplements before taking FOSAMAX PLUS D.**
- **Wait for at least 30 minutes after taking FOSAMAX PLUS D to eat, drink, or take other medicines or supplements.**
- **Do not lie down for at least 30 minutes after taking FOSAMAX PLUS D. Do not lie down until after your first food of the day.**

What are the possible side effects of FOSAMAX PLUS D?

Some patients may get severe digestive reactions from FOSAMAX PLUS D. (See "What is the most important information I should know about FOSAMAX PLUS D?".) These reactions include irritation, inflammation, or ulcers of the esophagus, which may sometimes bleed. This may occur especially if patients do not drink a full glass of water with FOSAMAX PLUS D or if they lie down in less than 30 minutes or before their first food of the day. Esophagus reactions may get worse if patients continue to take FOSAMAX PLUS D after developing symptoms of an irritated esophagus.

Stop taking FOSAMAX PLUS D and call your doctor right away if you get any of these signs of possible serious problems:

- Chest pain
- Heartburn
- Trouble or pain when swallowing

Side effects in patients taking FOSAMAX PLUS D usually have been mild. They generally have not caused patients to stop taking FOSAMAX PLUS D.

The most common side effect is abdominal (stomach area) pain. Less common side effects are nausea, vomiting, a full or bloated feeling in the stomach, constipation, diarrhea, black or bloody stools (bowel movements), gas, headache, a changed sense of taste, and bone, muscle, or joint pain.

Severe bone, joint, and/or muscle pain has been reported in patients taking, by mouth, bisphosphonate drugs that are used to treat osteoporosis (thin bones). However, such reports have been rare. This group of drugs includes FOSAMAX PLUS D. Most of the patients were postmenopausal women (women who had stopped having periods). Patients developed pain within one day to several months after starting the drug. Most patients experienced relief after stopping the drug. Patients who develop severe bone, joint, and/or muscle pain after starting FOSAMAX PLUS D should contact their physician.

Transient flu-like symptoms (rarely with fever), typically at the start of treatment, have occurred.

In rare cases, patients taking FOSAMAX PLUS D may get itching or eye pain, or a rash that may be made worse by sunlight. Rarely, severe skin reactions may occur. Patients may get allergic reactions, such as hives or, in rare cases, swelling that can be of their face, lips, tongue, or throat, which may cause trouble in breathing or swallowing. Mouth ulcers (sores) may occur if the FOSAMAX PLUS D tablet is chewed or dissolved in the mouth.

Rarely, patients have had jaw problems associated with delayed healing and infection, often following tooth extraction.

Anytime you have a medical problem you think may be from FOSAMAX PLUS D, even if it is not listed above, talk to your doctor.

What should I know about osteoporosis?

Normally your bones are being rebuilt all the time. First, old bone is removed (resorbed). Then a similar amount of new bone is formed. This balanced process keeps your skeleton healthy and strong.

Osteoporosis is a thinning and weakening of the bones. It is common in women after menopause, and may also occur in men. In osteoporosis, bone is removed faster than it is formed, so overall bone mass is lost and bones become weaker. Therefore, keeping bone mass is important to keep your bones healthy. In both men and women, osteoporosis may also be caused by certain medicines called corticosteroids.

At first, osteoporosis usually has no symptoms, but it can cause fractures (broken bones). Fractures usually cause pain. Fractures of the bones of the spine may not be painful, but over time they can make you shorter. Eventually, your spine can curve and your body can become bent over. Fractures may happen during normal, everyday activity, such as lifting, or from minor injury that would normally not cause bones to break. Fractures most often occur at the hip, spine, or wrist. This can lead to pain, severe disability, or loss of ability to move around (mobility).

Who is at risk for osteoporosis?

Many things put people at risk of osteoporosis. The following people have a higher chance of getting osteoporosis:

- Women who are going through or who are past menopause
- Men who are elderly

People who:

- Are white (Caucasian) or oriental (Asian)
- Are thin
- Have family member with osteoporosis
- Do not get enough calcium or vitamin D
- Do not exercise
- Smoke
- Drink alcohol often
- Take bone thinning medicines (like prednisone or other corticosteroids) for a long time

What should I know about vitamin D?

Vitamin D is an essential nutrient, required for calcium absorption and healthy bones. The main source is through exposure to summer sunlight, which makes vitamin D in our skin. Winter sunlight in most of the United States is too weak to produce vitamin D. Even in the summer, clothing or sun block can prevent enough sunlight from getting through. In addition, as people age, their skin becomes less able to make vitamin D. Very few foods are natural sources of vitamin D. Some foods, such as milk, some brands of orange juice and breakfast cereals are fortified with vitamin D.

Too little vitamin D leads to low calcium absorption and low phosphate. These are minerals that make bones strong. Even if you are eating a diet rich in calcium or taking a calcium supplement, your body cannot absorb calcium properly unless you have enough vitamin D. Too little vitamin D may lead to bone loss and osteoporosis. Severe vitamin D deficiency may cause muscle weakness which can lead to falls, and greater risk of fracture.

What can I do to help treat osteoporosis?

In addition to FOSAMAX PLUS D, your doctor may suggest one or more of the following lifestyle changes:

- **Stop smoking**. Smoking may increase your chance of getting osteoporosis.
- **Reduce the use of alcohol.** Too much alcohol may increase the chance of osteoporosis and injuries that can cause fractures.
- **Exercise regularly**. Like muscles, bones need exercise to stay strong and healthy. Exercise must be safe to prevent injuries, including fractures. Talk with your doctor before you begin any exercise program.
- **Eat a balanced diet**. Having enough calcium in your diet is important. Your doctor can advise you whether you need to change your diet or take any dietary supplements, such as calcium or additional vitamin D.

What are the ingredients in FOSAMAX PLUS D?

Active ingredients: alendronate sodium and cholecalciferol (vitamin D_3). FOSAMAX PLUS D provides a week's worth of vitamin D_3 (2800 IU). The Daily Value is 400 IU.
Inactive ingredients: cellulose, lactose, medium chain triglycerides, gelatin, croscarmellose sodium, sucrose, colloidal silicon dioxide, magnesium stearate, butylated hydroxytoluene, modified food starch, and sodium aluminum silicate.

How do I store FOSAMAX PLUS D?

- Store FOSAMAX PLUS D at 68 to 77°F (20 to 25°C). Protect from moisture and light. Store tablets in the original blister package or bottle and carton until time of use.
- Safely discard FOSAMAX PLUS D that is out-of-date or no longer needed.
- **Keep all FOSAMAX PLUS D and all medicines out of the reach of children.**

General information about using FOSAMAX PLUS D safely and effectively

Medicines are sometimes prescribed for conditions that are not mentioned in patient information leaflets. This medicine was prescribed for your particular condition. Alendronate in FOSAMAX PLUS D acts specifically on your bones. Do not use it for another condition or give it to others.

This leaflet is a summary of information about FOSAMAX PLUS D. If you have any questions or concerns about FOSAMAX PLUS D or osteoporosis, talk to your doctor, pharmacist, or other health care provider. You can ask your doctor or pharmacist for information about FOSAMAX PLUS D written for health care providers. For more information, call 1-877-408-4699 (toll-free) or visit the following website: www.fosamaxplusd.com.

Rx only

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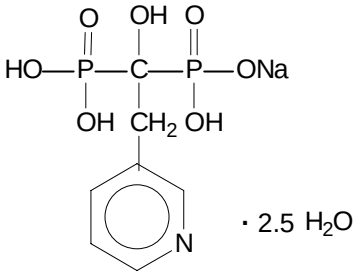
ACTONEL® with CALCIUM
(risedronate sodium tablets with calcium carbonate tablets, USP)

DESCRIPTION
ACTONEL with CALCIUM is a co-package product containing ACTONEL (risedronate sodium tablets, 35 mg) for once weekly dosing and calcium carbonate tablets, USP (1250 mg, equivalent to 500 mg elemental calcium) for daily dosing for the remaining 6 days of the week. Each package contains a 28-day course of therapy.

ACTONEL
ACTONEL (risedronate sodium tablets) is a pyridinyl bisphosphonate that inhibits osteoclast-mediated bone resorption and modulates bone metabolism. Each ACTONEL tablet in the ACTONEL with CALCIUM co-package contains the equivalent of 35 mg of anhydrous risedronate sodium in the form of the hemi-pentahydrate with small amounts of monohydrate. The empirical formula for risedronate sodium hemi-pentahydrate is $C_7H_{10}NO_7P_2Na \cdot 2.5\ H_2O$. The chemical name of risedronate sodium is [1-hydroxy-2-(3-pyridinyl)ethylidene]bis[phosphonic acid] monosodium salt. The chemical structure of risedronate sodium hemi-pentahydrate is the following:



Molecular Weight:	
Anhydrous:	305.10
Hemi-pentahydrate:	350.13

Risedronate sodium is a fine, white to off-white, odorless, crystalline powder. It is soluble in water and in aqueous solutions, and essentially insoluble in common organic solvents.

CALCIUM
The empirical formula for calcium carbonate is $CaCO_3$ and the molecular weight is 100.09.

Calcium carbonate is supplied as a calcium carbonate tablet, USP containing 1250 mg calcium carbonate (equivalent to 500 mg elemental calcium). Calcium carbonate is a fine, white, odorless, tasteless powder. It is stable and non-hygroscopic.

Calcium carbonate is formulated per USP standards to meet disintegration or dissolution, weight, purity, and potency requirements.

Inactive Ingredients:

ACTONEL

Crospovidone, ferric oxide red, ferric oxide yellow, hydroxypropyl cellulose, hydroxypropyl methylcellulose, lactose monohydrate, magnesium stearate, microcrystalline cellulose, polyethylene glycol, silicon dioxide, titanium dioxide.

CALCIUM

Pregelatinized starch, sodium starch glycolate, FD&C Blue #2, magnesium stearate, polyethylene glycol 3350, hypromellose, Opaspray Light Blue, polysorbate 80.

CLINICAL PHARMACOLOGY

ACTONEL

Mechanism of Action:

ACTONEL has an affinity for hydroxyapatite crystals in bone and acts as an antiresorptive agent. At the cellular level, ACTONEL inhibits osteoclasts. The osteoclasts adhere normally to the bone surface, but show evidence of reduced active resorption (e.g., lack of ruffled border). Histomorphometry in rats, dogs, and minipigs showed that ACTONEL treatment reduces bone turnover (activation frequency, i.e., the rate at which bone remodeling sites are activated) and bone resorption at remodeling sites.

Pharmacokinetics:

Absorption:

Absorption after an oral dose is relatively rapid (t_{max} ~1 hour) and occurs throughout the upper gastrointestinal tract. The fraction of the dose absorbed is independent of dose over the range studied (single dose, 2.5 to 30 mg; multiple dose, 2.5 to 5 mg). Steady-state conditions in the serum are observed within 57 days of daily dosing. Mean absolute oral bioavailability of the 30-mg tablet is 0.63% (90% CI: 0.54% to 0.75%) and is comparable to a solution. The extent of absorption of a 30-mg dose (three 10-mg tablets) when administered 0.5 hours before breakfast is reduced by 55% compared to dosing in the fasting state (no food or drink for 10 hours prior to or 4 hours after dosing). Dosing 1 hour prior to breakfast reduces the extent of absorption by 30% compared to dosing in the fasting state. Dosing either 0.5 hours prior to breakfast or 2 hours after dinner (evening meal) results in a similar extent of absorption. ACTONEL is effective when administered at least 30 minutes before breakfast.

Distribution:

The mean steady-state volume of distribution is 6.3 L/kg in humans. Human plasma protein binding of drug is about 24%. Preclinical studies in rats and dogs dosed intravenously with single doses of [^{14}C] risedronate indicate that approximately 60% of the dose is distributed to bone. The remainder of the dose is excreted in the urine. After multiple oral dosing in rats, the uptake of risedronate in soft tissues was in the range of 0.001% to 0.01%.

Metabolism:

There is no evidence of systemic metabolism of risedronate.

Elimination:
Approximately half of the absorbed dose is excreted in urine within 24 hours, and 85% of an intravenous dose is recovered in the urine over 28 days. Mean renal clearance is 105 mL/min (CV = 34%) and mean total clearance is 122 mL/min (CV = 19%), with the difference primarily reflecting nonrenal clearance or clearance due to adsorption to bone. The renal clearance is not concentration dependent, and there is a linear relationship between renal clearance and creatinine clearance. Unabsorbed drug is eliminated unchanged in feces. Once risedronate is absorbed, the serum concentration-time profile is multi-phasic, with an initial half-life of about 1.5 hours and a terminal exponential half-life of 480 hours. This terminal half-life is hypothesized to represent the dissociation of risedronate from the surface of bone.

CALCIUM
Calcium is a major substrate for mineralization and has an antiresorptive effect on bone. Calcium suppresses PTH secretion and decreases bone turnover. Increased levels of PTH are known to contribute to age-related bone loss, especially at cortical sites, while increased bone turnover is an independent risk factor of fractures.

Pharmacokinetics:
Absorption:
Calcium is released from calcium complexes during digestion in a soluble, ionized form, for absorption from the small intestine. Absorption can be by both passive and active mechanisms. Active absorption of calcium is highly dependent on vitamin D, and vitamin D deficiency decreases the absorption of calcium. As calcium intake increases, the active transfer mechanism becomes saturated and an increasing proportion of calcium is absorbed via passive diffusion. Absorption of calcium carbonate is dose-dependent, with fractional absorption being highest when at doses up to 500 mg. Absorption of calcium is also dependent on pH with reduced absorption in alkaline conditions. The absorption of calcium from calcium carbonate is increased when taken with food.

Distribution:
Approximately 50% of calcium in the serum is in the physiologically active ionized form; about 10% is complexed to phosphate, citrate or other anions. The remaining 40% is bound to proteins, primarily albumin.

Elimination:
Unabsorbed calcium from the small intestine is excreted in the feces. Renal excretion depends largely on glomerular filtration and calcium tubular reabsorption with more than 98% of calcium reabsorbed from the glomerular filtrate. This process is regulated by active vitamin D and PTH.

Special Populations:
ACTONEL
Pediatric:
Risedronate pharmacokinetics have not been studied in patients <18 years of age.

Gender:
Bioavailability and pharmacokinetics following oral administration are similar in men and women.

Geriatric:
Bioavailability and disposition are similar in elderly (>60 years of age) and younger subjects. No dosage adjustment is necessary.

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

Renal Insufficiency:
Risedronate is excreted unchanged primarily via the kidney. As compared to persons with normal renal function, the renal clearance of risedronate was decreased by about 70% in patients with creatinine clearance of approximately 30 mL/min. ACTONEL is not recommended for use in patients with severe renal impairment (creatinine clearance <30 mL/min) because of lack of clinical experience. No dosage adjustment is necessary in patients with a creatinine clearance ≥30 mL/min.

Hepatic Insufficiency:
No studies have been performed to assess risedronate's safety or efficacy in patients with hepatic impairment. Risedronate is not metabolized in rat, dog, and human liver preparations. Insignificant amounts (<0.1% of intravenous dose) of drug are excreted in the bile in rats. Therefore, dosage adjustment is unlikely to be needed in patients with hepatic impairment.

CALCIUM
Absorption of calcium from calcium carbonate is poor in patients with achlorhydria unless taken with food.

Gender:
Absorption of calcium from calcium carbonate has not been adequately studied with respect to gender.

Geriatric:
There are no clinically significant differences in bioavailability following administration of 1 g elemental calcium as calcium carbonate between young (20 – 27 years) and elderly (63 – 71 years) females.

Race:
The effect of race on calcium absorption from oral calcium carbonate has not been studied.

Renal Insufficiency:
Renal disease affects calcium homeostasis through its effects on vitamin D metabolism, phosphorus excretion, and PTH. Calcium should be administered cautiously to patients with renal disease (creatinine clearance <30 mL/min) to avoid elevations of the calcium-phosphorus ion product (Ca x Phos) and the development of calcinosis.

Pharmacodynamics:
ACTONEL

Treatment and Prevention of Osteoporosis in Postmenopausal Women:
Osteoporosis is characterized by decreased bone mass and increased fracture risk, most commonly at the spine, hip, and wrist.

The diagnosis can be confirmed by the finding of low bone mass, evidence of fracture on x-ray, a history of osteoporotic fracture, or height loss or kyphosis indicative of vertebral fracture. Osteoporosis occurs in both men and women but is more common among women following menopause. In healthy humans, bone formation and resorption are closely linked; old bone is resorbed and replaced by newly-formed bone. In postmenopausal osteoporosis, bone resorption exceeds bone formation, leading to bone loss and increased risk of bone fracture. After menopause, the risk of fractures of the spine and hip increases; approximately 40% of 50 year-old women will experience an osteoporosis-related fracture during their remaining lifetimes. After experiencing 1 osteoporosis-related fracture, the risk of future fracture increases 5-fold compared to the risk among a non-fractured population.

ACTONEL treatment decreases the elevated rate of bone turnover that is typically seen in postmenopausal osteoporosis. In clinical trials, administration of ACTONEL to postmenopausal women resulted in decreases in biochemical markers of bone turnover, including urinary deoxypyridinoline/creatinine and urinary collagen cross-linked N-telopeptide (markers of bone resorption) and serum bone specific alkaline phosphatase (a marker of bone formation). At the 5-mg dose, decreases in deoxypyridinoline/creatinine were evident within 14 days of treatment. Changes in bone formation markers were observed later than changes in resorption markers, as expected, due to the coupled nature of bone resorption and bone formation; decreases in bone specific alkaline phosphatase of about 20% were evident within 3 months of treatment. Bone turnover markers reached a nadir of about 40% below baseline values by the sixth month of treatment and remained stable with continued treatment for up to 3 years. Bone turnover is decreased as early as 14 days and maximally within about 6 months of treatment, with achievement of a new steady-state that more nearly approximates the rate of bone turnover seen in premenopausal women. In a 1-year study comparing daily versus weekly oral dosing regimens of ACTONEL for the treatment of osteoporosis in postmenopausal women, ACTONEL 5-mg daily and ACTONEL 35-mg once a week decreased urinary collagen cross-linked N-telopeptide by 60% and 61%, respectively. In addition, serum bone-specific alkaline phosphatase was also reduced by 42% and 41% in the ACTONEL 5-mg daily and ACTONEL 35-mg once a week groups, respectively. ACTONEL is not an estrogen and does not have the benefits and risks of estrogen therapy.

As a result of the inhibition of bone resorption, asymptomatic and usually transient decreases from baseline in serum calcium (<1%) and serum phosphate (<3%) and compensatory increases in serum PTH levels (<30%) were observed within 6 months in patients in osteoporosis clinical trials. There were no significant differences in serum calcium, phosphate, or PTH levels between the ACTONEL and placebo groups at 3 years. In a 1-year study comparing daily versus weekly oral dosing regimens of ACTONEL in postmenopausal women, the mean changes from baseline at 12 months were similar between the ACTONEL 5-mg daily and ACTONEL 35-mg

once a week groups, respectively, for serum calcium (0.4% and 0.7%), phosphate (-3.8% and -2.6%) and PTH (6.4% and 4.2%).

CALCIUM

Calcium administration decreases the elevated rate of bone turnover typically seen in postmenopausal women with osteoporosis. In randomized, placebo controlled studies in postmenopausal women, calcium administration (500 mg to 1600 mg) decreased biochemical markers of bone turnover, including urine N-telopeptide, urine free pyridinoline (markers of bone resorption), alkaline phosphatase and osteocalcin (markers of bone formation) relative to placebo treated women.

Calcium administration may transiently increase levels of serum calcium with compensatory reductions in serum PTH and an increase in urinary calcium. However, urinary and serum calcium levels usually remain within the normal reference range.

CLINICAL STUDIES

ACTONEL

Treatment of Osteoporosis in Postmenopausal Women:

The fracture efficacy of ACTONEL 5 mg daily in the treatment of postmenopausal osteoporosis was demonstrated in 2 large, randomized, placebo-controlled, double-blind studies that enrolled a total of almost 4000 postmenopausal women under similar protocols. The Multinational study (VERT MN) (ACTONEL 5 mg, n = 408) was conducted primarily in Europe and Australia; a second study was conducted in North America (VERT NA) (ACTONEL 5 mg, n = 821). Patients were selected on the basis of radiographic evidence of previous vertebral fracture, and therefore, had established disease. The average number of prevalent vertebral fractures per patient at study entry was 4 in VERT MN, and 2.5 in VERT NA, with a broad range of baseline bone mineral density (BMD) levels. All patients in these studies received supplemental calcium 1000 mg/day. Patients with low vitamin D levels (approximately 40 nmol/L or less) also received supplemental vitamin D 500 IU/day.

Positive effects of ACTONEL treatment on BMD were also demonstrated in each of 2 large, randomized, placebo-controlled trials (BMD MN and BMD NA) in which almost 1200 postmenopausal women (ACTONEL 5 mg, n = 394) were recruited on the basis of low lumbar spine bone mass (more than 2 SD below the premenopausal mean) rather than a history of vertebral fracture.

ACTONEL 35-mg once a week (n = 485) was shown to be therapeutically equivalent to ACTONEL 5-mg daily (n = 480) in a 1-year, double-blind, multicenter study of postmenopausal women with osteoporosis. In the primary efficacy analysis of completers, the mean increases from baseline in lumbar spine BMD at 1 year were 4.0% (3.7, 4.3; 95% confidence interval [CI]) in the 5-mg daily group (n = 391) and 3.9% (3.6, 4.3; 95% CI) in the 35-mg once a week group (n = 387) and the mean difference between 5 mg daily and 35 mg weekly was 0.1%(-0.42, 0.55; 95% CI). The results of the intent-to-treat analysis with the last observation carried forward were consistent with the primary efficacy analysis of completers. The 2 treatment groups were also similar with regard to BMD increases at other skeletal sites.

Effect on Vertebral Fractures:

Fractures of previously undeformed vertebrae (new fractures) and worsening of pre-existing vertebral fractures were diagnosed radiographically; some of these fractures were also associated with symptoms (i.e., clinical fractures). Spinal radiographs were scheduled annually and prospectively planned analyses were based on the time to a patient's first diagnosed fracture. The primary endpoint for these studies was the incidence of new and worsening vertebral fractures across the period of 0 to 3 years. ACTONEL 5 mg daily significantly reduced the incidence of new and worsening vertebral fractures and of new vertebral fractures in both VERT NA and VERT MN at all time points (Table 1). The reduction in risk seen in the subgroup of patients who had 2 or more vertebral fractures at study entry was similar to that seen in the overall study population.

Table 1
The Effect of ACTONEL on the Risk of Vertebral Fractures

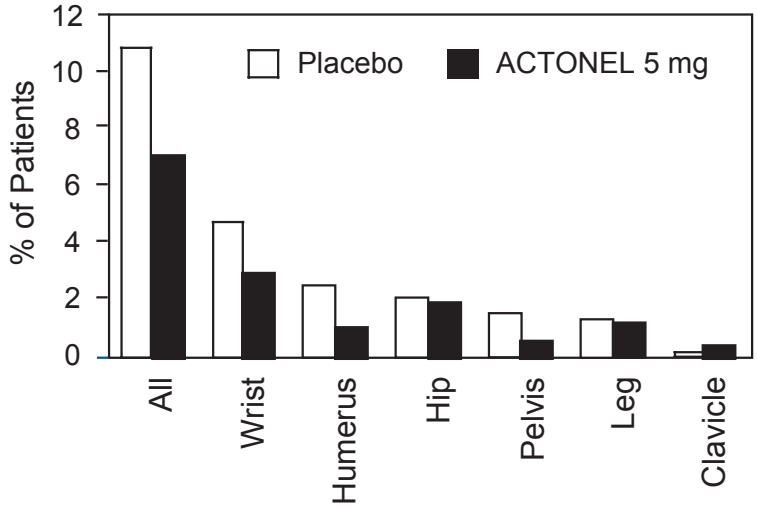
	Proportion of Patients with Fracture (%)[a]			
VERT NA	Placebo n = 678	ACTONEL 5 mg n = 696	Absolute Risk Reduction (%)	Relative Risk Reduction (%)
New and Worsening				
0 - 1 Year	7.2	3.9	3.3	49
0 - 2 Years	12.8	8.0	4.8	42
0 - 3 Years	18.5	13.9	4.6	33
New				
0 - 1 Year	6.4	2.4	4.0	65
0 - 2 Years	11.7	5.8	5.9	55
0 - 3 Years	16.3	11.3	5.0	41
VERT MN	Placebo n = 346	ACTONEL 5 mg n = 344	Absolute Risk Reduction (%)	Relative Risk Reduction (%)
New and Worsening				
0 - 1 Year	15.3	8.2	7.1	50
0 - 2 Years	28.3	13.9	14.4	56
0 - 3 Years	34.0	21.8	12.2	46
New				
0 - 1 Year	13.3	5.6	7.7	61
0 - 2 Years	24.7	11.6	13.1	59
0 - 3 Years	29.0	18.1	10.9	49

[a] Calculated by Kaplan-Meier methodology.

Effect on Osteoporosis-Related Nonvertebral Fractures:

In VERT MN and VERT NA, a prospectively planned efficacy endpoint was defined consisting of all radiographically confirmed fractures of skeletal sites accepted as associated with osteoporosis. Fractures at these sites were collectively referred to as osteoporosis-related nonvertebral fractures. ACTONEL 5 mg daily significantly reduced the incidence of nonvertebral osteoporosis-related fractures over 3 years in VERT NA (8% vs. 5%; relative risk reduction 39%) and reduced the fracture incidence in VERT MN from 16% to 11%. There was a significant reduction from 11% to 7% when the studies were combined, with a corresponding 36% reduction in relative risk. Figure 1 shows the overall results as well as the results at the individual skeletal sites for the combined studies.

Figure 1
Nonvertebral Osteoporosis-Related Fractures
Cumulative Incidence Over 3 Years
Combined VERT MN and VERT NA



Effect on Height:

In the two 3-year osteoporosis treatment studies, standing height was measured yearly by stadiometer. Both ACTONEL and placebo-treated groups lost height during the studies. Patients who received ACTONEL had a statistically significantly smaller loss of height than those who received placebo. In VERT MN, the median annual height change was -1.3 mm/yr in the ACTONEL 5-mg daily group compared to -2.4 mm/yr in the placebo group. In VERT NA, the median annual height change was -0.7 mm/yr in the ACTONEL 5-mg daily group compared to -1.1 mm/yr in the placebo group.

Effect on Bone Mineral Density:

The results of 4 randomized, placebo-controlled trials in women with postmenopausal osteoporosis (VERT MN, VERT NA, BMD MN, BMD NA) demonstrate that ACTONEL 5 mg daily increases BMD at the spine, hip, and wrist compared to the effects seen with placebo. Table 2 displays the significant increases in BMD seen at the lumbar spine, femoral neck, femoral trochanter, and midshaft radius in these trials compared to placebo. Thus, overall ACTONEL reverses the loss of BMD, a central factor in the progression of osteoporosis. In both VERT studies (VERT MN and VERT NA), ACTONEL 5 mg daily produced increases in lumbar spine BMD that were progressive over the 3 years of treatment, and were statistically significant relative to baseline and to placebo at 6 months and at all later time points.

Table 2
Mean Percent Increase in BMD from Baseline in Patients Taking ACTONEL 5 mg or Placebo at Endpoint[a]

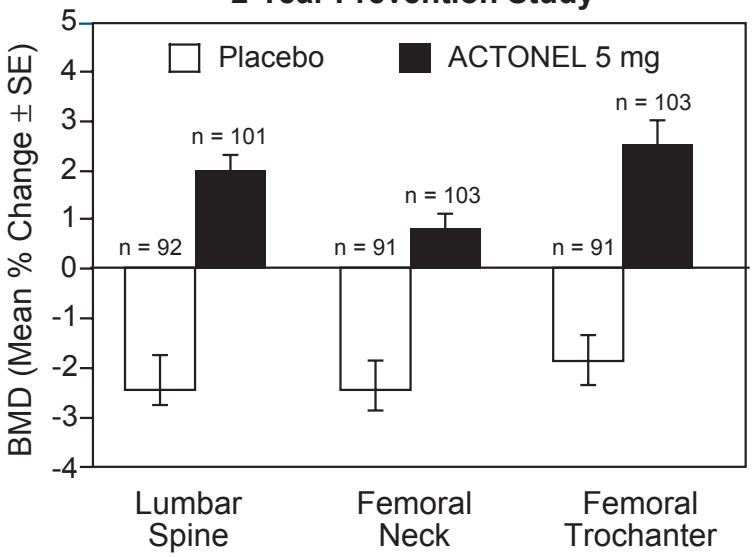
	VERT MN[b]		VERT NA[b]		BMD MN[c]		BMD NA[c]	
	Placebo n = 323	5 mg n = 323	Placebo n = 599	5 mg n = 606	Placebo n = 161	5 mg n = 148	Placebo n = 191	5 mg n = 193
Lumbar Spine	1.0	6.6	0.8	5.0	0.0	4.0	0.2	4.8
Femoral Neck	-1.4	1.6	-1.0	1.4	-1.1	1.3	0.1	2.4
Femoral Trochanter	-1.9	3.9	-0.5	3.0	-0.6	2.5	1.3	4.0
Midshaft Radius	-1.5*	0.2*	-1.2*	0.1*	ND		ND	

[a] The endpoint value is the value at the study's last time point for all patients who had BMD measured at that time; otherwise the last postbaseline BMD value prior to the study's last time point is used.
[b] The duration of the studies was 3 years.
[c] The duration of the studies was 1.5 to 2 years.
* BMD of the midshaft radius was measured in a subset of centers in VERT MN (placebo, n = 222; 5 mg, n = 214) and VERT NA (placebo, n = 310; 5 mg, n = 306)
ND = analysis not done

Histology/Histomorphometry:
Bone biopsies from 110 postmenopausal women were obtained at endpoint. Patients had received daily ACTONEL (2.5 mg or 5 mg) or placebo for 2 to 3 years. Histologic evaluation (n = 103) showed no osteomalacia, impaired bone mineralization, or other adverse effects on bone in ACTONEL-treated women. These findings demonstrate that bone formed during ACTONEL administration is of normal quality. The histomorphometric parameter mineralizing surface, an index of bone turnover, was assessed based upon baseline and post-treatment biopsy samples from 23 patients treated with ACTONEL 5 mg and 21 treated with placebo. Mineralizing surface decreased moderately in ACTONEL-treated patients (median percent change: ACTONEL 5 mg, -74%; placebo, -21%), consistent with the known effects of treatment on bone turnover.

Prevention of Osteoporosis in Postmenopausal Women:
ACTONEL 5 mg daily prevented bone loss in a majority of postmenopausal women (age range 42 to 63 years) within 3 years of menopause in a 2-year, double-blind, placebo-controlled study in 383 patients (ACTONEL 5 mg, n = 129). All patients in this study received supplemental calcium 1000 mg/day. Increases in BMD were observed as early as 3 months following initiation of ACTONEL treatment. ACTONEL 5 mg produced significant mean increases in BMD at the lumbar spine, femoral neck, and trochanter compared to placebo at the end of the study (Figure 2). ACTONEL 5 mg daily was also effective in patients with lower baseline lumbar spine BMD (more than 1 SD below the premenopausal mean) and in those with normal baseline lumbar spine BMD. Bone mineral density at the distal radius decreased in both ACTONEL and placebo-treated women following 1 year of treatment.

Figure 2
Change in BMD from Baseline
2-Year Prevention Study



Combined Administration with Hormone Replacement Therapy:
The effects of combining ACTONEL 5 mg daily with conjugated estrogen 0.625 mg daily (n = 263) were compared to the effects of conjugated estrogen alone (n = 261) in a 1-year, randomized, double-blind study of women ages 37 to 82 years, who were on average 14 years postmenopausal. The BMD results for this study are presented in Table 3.

Table 3
Percent Change from Baseline in BMD
After 1 Year of Treatment

	Estrogen 0.625 mg n = 261	ACTONEL 5 mg + Estrogen 0.625 mg n = 263
Lumbar Spine	4.6 ± 0.20	5.2 ± 0.23
Femoral Neck	1.8 ± 0.25	2.7 ± 0.25
Femoral Trochanter	3.2 ± 0.28	3.7 ± 0.25
Midshaft Radius	0.4 ± 0.14	0.7 ± 0.17
Distal Radius	1.7 ± 0.24	1.6 ± 0.28

Values shown are mean (± SEM) percent change from baseline.

Histology/Histomorphometry:
Bone biopsies from 53 postmenopausal women were obtained at endpoint. Patients had received ACTONEL 5 mg plus estrogen or estrogen alone once daily for 1 year. Histologic evaluation (n = 47) demonstrated that the bone of patients treated with ACTONEL plus estrogen was of normal lamellar structure and normal mineralization. The histomorphometric parameter mineralizing surface, a measure of bone turnover, was assessed based upon baseline and post-treatment biopsy samples from 12 patients treated with ACTONEL plus estrogen and 12 treated with estrogen alone. Mineralizing surface decreased in both treatment groups (median percent change: ACTONEL plus estrogen, -79%; estrogen alone, -50%), consistent with the known effects of these agents on bone turnover.

ANIMAL PHARMACOLOGY AND/OR TOXICOLOGY

ACTONEL

Risedronate demonstrated potent anti-osteoclast, antiresorptive activity in ovariectomized rats and minipigs. Bone mass and biomechanical strength were increased dose-dependently at oral doses up to 4 and 25 times the human recommended oral dose of 35 mg/week based on surface area, (mg/m^2) for rats and minipigs, respectively. Risedronate treatment maintained the positive correlation between BMD and bone strength and did not have a negative effect on bone structure or mineralization. In intact dogs, risedronate induced positive bone balance at the level of the bone remodeling unit at oral doses ranging from 0.35 to 1.4 times the human 35 mg/week dose based on surface area (mg/m^2).

In dogs treated with an oral dose of 1 mg/kg/day (approximately 5 times the human 35 mg/week dose based on surface area, mg/m^2), risedronate caused a delay in fracture healing of the radius. The observed delay in fracture healing is similar to other bisphosphonates. This effect did not occur at a dose of 0.1 mg/kg/day (approximately 0.5 times the human 35 mg/week dose based on surface area, mg/m^2).

The Schenk rat assay, based on histologic examination of the epiphyses of growing rats after drug treatment, demonstrated that risedronate did not interfere with bone mineralization even at the highest dose tested (5 mg/kg/day, subcutaneously), which was approximately 3500 times the lowest antiresorptive dose (1.5 mcg/kg/day in this model) and approximately 8 times the human 35 mg/week dose based on surface area (mg/m^2). This indicates that ACTONEL administered at the therapeutic dose is unlikely to induce osteomalacia.

CALCIUM

Published studies have demonstrated that changes in the dietary intake of calcium affect bone growth and skeletal development in animals, as well as bone loss in animal models of estrogen-depletion/ovariectomy and aging.

INDICATIONS AND USAGE

Postmenopausal Osteoporosis:

ACTONEL with CALCIUM is indicated for the treatment and prevention of osteoporosis in postmenopausal women.

Treatment of Osteoporosis:

In postmenopausal women with osteoporosis, ACTONEL increases BMD and reduces the incidence of vertebral fractures and a composite endpoint of nonvertebral osteoporosis-related fractures (see **CLINICAL STUDIES**). Osteoporosis may be confirmed by the presence or history of osteoporotic fracture, or by the finding of low bone mass (for example, at least 2 SD below the premenopausal mean).

Prevention of Osteoporosis:

ACTONEL may be considered in postmenopausal women who are at risk of developing osteoporosis and for whom the desired clinical outcome is to maintain bone mass and to reduce the risk of fracture.

Factors such as family history of osteoporosis, previous fracture, smoking, BMD (at least 1 SD below the premenopausal mean), high bone turnover, thin body frame, Caucasian or Asian race, and early menopause are associated with an increased risk of developing osteoporosis and fractures. The presence of these risk factors may be important when considering the use of ACTONEL for prevention of osteoporosis.

CONTRAINDICATIONS

ACTONEL

- Hypocalcemia (see **PRECAUTIONS, General**)
- Known hypersensitivity to any component of this product
- Inability to stand or sit upright for at least 30 minutes

CALCIUM

- Hypercalcemia from any cause including, but not limited to, hyperparathyroidism, hypercalcemia of malignancy, or sarcoidosis.
- Known hypersensitivity to any component of the product.

WARNINGS

ACTONEL

Bisphosphonates may cause upper gastrointestinal disorders such as dysphagia, esophagitis, and esophageal or gastric ulcer (see **PRECAUTIONS**).

CALCIUM

See **PRECAUTIONS**

PRECAUTIONS

General:

ACTONEL

Hypocalcemia and other disturbances of bone and mineral metabolism should be effectively treated before starting ACTONEL therapy. Adequate intake of calcium and vitamin D is important in all patients. ACTONEL is not recommended for use in patients with severe renal impairment (creatinine clearance <30 mL/min).

Bisphosphonates have been associated with gastrointestinal disorders such as dysphagia, esophagitis, and esophageal or gastric ulcers. This association has been reported for bisphosphonates in postmarketing experience, but has not been found in most pre-approval clinical trials, including those conducted with ACTONEL. Patients should be advised that taking the medication according to the instructions is important to minimize the risk of these events. They should take ACTONEL with sufficient plain water (6 to 8 oz) to facilitate delivery to the stomach, and should not lie down for 30 minutes after taking the drug.

Osteonecrosis, primarily in the jaw, has been reported in patients treated with bisphosphonates. Most cases have been in cancer patients undergoing dental procedures such as tooth extraction, but some have occurred in patients with postmenopausal osteoporosis or other diagnoses. Most

reported cases have been in patients treated with bisphosphonates intravenously but some have been in patients treated orally.

For patients requiring dental procedures, there are no data available to suggest whether discontinuation of bisphosphonate treatment, prior to the procedure, reduces the risk of osteonecrosis of the jaw. Clinical judgement should guide the management plan of each patient based on individual benefit/risk assessment.

Musculoskeletal Pain:
In postmarketing experience, there have been infrequent reports of severe and occasionally incapacitating bone, joint, and/or muscle pain in patients taking bisphosphonates (see **ADVERSE REACTIONS**). The time to onset of symptoms varied from one day to several months after starting the drug. Most patients had relief of symptoms after stopping medication. A subset had recurrence of symptoms when rechallenged with the same drug or another bisphosphonate.

CALCIUM
ACTONEL with CALCIUM should not be used to treat hypocalcemia. Total daily intake of calcium above 1500 mg has not demonstrated additional bone benefits while daily intake above 2000 mg has been associated with increased risk of adverse effects, including hypercalcemia and kidney stones.

Administration of calcium has been associated with a slight increase in the risk of kidney stones.

In patients with a history of kidney stones or hypercalciuria, metabolic assessment to seek treatable causes of these conditions is warranted. If administration of calcium tablets should be needed in these patients, urinary calcium excretion and other appropriate testing should be monitored periodically.

Patients with achlorhydria may have decreased absorption of calcium. Taking calcium with food enhances absorption.

Concomitant use of calcium-containing antacids should be monitored to avoid excessive intake of calcium.

Information for Patients:
ACTONEL
The patient should be informed to pay particular attention to the dosing instructions as clinical benefits may be compromised by failure to take the drug according to instructions. Specifically, ACTONEL should be taken at least 30 minutes before the first food or drink of the day other than water.

To facilitate delivery to the stomach, and thus reduce the potential for esophageal irritation, patients should take ACTONEL while in an upright position (sitting or standing) with a full glass of plain water (6 to 8 oz). Patients should not lie down for 30 minutes after taking the

medication (see **PRECAUTIONS, General**). Patients should not chew or suck on the tablet because of a potential for oropharyngeal irritation.

Patients should be instructed that if they develop symptoms of esophageal disease (such as difficulty or pain upon swallowing, retrosternal pain or severe persistent or worsening heartburn) they should consult their physician before continuing ACTONEL.

Patients should be instructed that if they miss a dose of ACTONEL 35-mg once a week, they should take 1 tablet on the morning after they remember and return to taking 1 tablet once a week, as originally scheduled on their chosen day. Patients should not take 2 tablets on the same day.

Patients should receive supplemental calcium and vitamin D if dietary intake is inadequate (see **PRECAUTIONS, General**). Calcium supplements or calcium-, aluminum-, and magnesium-containing medications may interfere with the absorption of ACTONEL and should be taken at a different time of the day, as with food.

Weight-bearing exercise should be considered along with the modification of certain behavioral factors, such as excessive cigarette smoking, and/or alcohol consumption, if these factors exist.

Physicians should instruct their patients to read the Patient Information before starting therapy with ACTONEL 35 mg and to re-read it each time the prescription is renewed.

Patients should be reminded to give all of their health care providers an accurate medication history. Instruct patients to tell all of their health care providers that they are taking ACTONEL. Patients should be instructed that any time they have a medical problem they think may be from ACTONEL, they should talk to their doctor.

CALCIUM

Calcium should be used as an adjunct to osteoporosis therapies.

The patient should be informed to take the calcium tablets with food to facilitate calcium absorption.

Drug Interactions:

ACTONEL

No specific drug-drug interaction studies were performed. Risedronate is not metabolized and does not induce or inhibit hepatic microsomal drug-metabolizing enzymes (Cytochrome P450).

Calcium Supplements/Antacids:

Co-administration of ACTONEL and calcium, antacids, or oral medications containing divalent cations will interfere with the absorption of ACTONEL.

Hormone Replacement Therapy:

One study of about 500 early postmenopausal women has been conducted to date in which treatment with ACTONEL (5 mg/day) plus estrogen replacement therapy was compared to

estrogen replacement therapy alone. Exposure to study drugs was approximately 12 to 18 months and the primary endpoint was change in BMD. If considered appropriate, ACTONEL may be used concomitantly with hormone replacement therapy.

Aspirin/Nonsteroidal Anti-Inflammatory Drugs (NSAIDs):
Of over 5700 patients enrolled in the ACTONEL Phase 3 osteoporosis studies, aspirin use was reported by 31% of patients, 24% of whom were regular users (3 or more days per week). Forty-eight percent of patients reported NSAID use, 21% of whom were regular users. Among regular aspirin or NSAID users, the incidence of upper gastrointestinal adverse experiences in ACTONEL-treated patients (24.5%) was similar to that in placebo-treated patients (24.8%).

H_2 Blockers and Proton Pump Inhibitors (PPIs):
Of over 5700 patients enrolled in the ACTONEL Phase 3 osteoporosis studies, 21% used H_2 blockers and/or PPIs. Among these patients, the incidence of upper gastrointestinal adverse experiences in the ACTONEL-treated patients was similar to that in placebo-treated patients.

CALCIUM
Bisphosphonates:
Oral bisphosphonates (such as risedronate, alendronate, etidronate, ibandronate): Decreased absorption of the bisphosphonate may occur when the bisphosphonate and calcium are taken together.

Thyroid hormones:
Levothyroxine: Concomitant intake of levothyroxine and calcium carbonate was found to reduce levothyroxine absorption and increase serum thyrotropin levels.

Fluoroquinolones:
Fluoroquinolones (such as ciprofloxacin, moxifloxacin, and ofloxacin): Concomitant administration of a fluoroquinolone and calcium carbonate may decrease the absorption of the fluoroquinolone.

Systemic glucocorticoids:
Calcium absorption is reduced when calcium carbonate is taken concomitantly with systemic glucocorticoids.

Tetracyclines:
Tetracyclines (such as doxycycline, minocycline, tetracycline): Concomitant administration of a tetracycline and calcium carbonate may decrease the absorption of the tetracycline.

Thiazide diuretics:
Reduced urinary excretion of calcium has been reported during concomitant use of calcium carbonate and thiazide diuretics.

Vitamin D:
Vitamin D and vitamin D analogues (such as calcitriol, doxercalciferol, and paricalcitol): Absorption of calcium may be increased when calcium carbonate is given concomitantly with vitamin D analogues.

Iron:
Calcium may interfere with the absorption of iron. Patients being treated for iron deficiency should take iron and calcium at different times of the day.

Drug/Laboratory Test Interactions:
ACTONEL
Bisphosphonates are known to interfere with the use of bone-imaging agents. Specific studies with ACTONEL have not been performed.

Carcinogenesis, Mutagenesis, Impairment of Fertility:
Carcinogenesis:
In a 104-week carcinogenicity study, rats were administered daily oral doses of risedronate up to 24 mg/kg/day (approximately 50 times the systemic exposure following a 35 mg/week human dose based on surface area, mg/m^2). There were no significant drug-induced tumor findings in male or female rats. The high dose male group of 24 mg/kg/day was terminated early in the study (Week 93) due to excessive toxicity, and data from this group were not included in the statistical evaluation of the study results. In an 80-week carcinogenicity study, mice were administered daily oral doses up to 32 mg/kg/day (approximately 30 times the systemic exposure following a 35 mg/week human dose based on surface area, mg/m^2). There were no significant drug-induced tumor findings in male or female mice.

Mutagenesis:
Risedronate did not exhibit genetic toxicity in the following assays: *In vitro* bacterial mutagenesis in *Salmonella* and *E. coli* (Ames assay), mammalian cell mutagenesis in CHO/HGPRT assay, unscheduled DNA synthesis in rat hepatocytes and an assessment of chromosomal aberrations *in vivo* in rat bone marrow.

Impairment of Fertility:
In female rats, ovulation was inhibited at an oral dose of risedronate of 16 mg/kg/day (approximately 30 times the systemic exposure following a 35 mg/week human dose based on surface area, mg/m^2). Decreased implantation was noted in female rats treated with doses $\geq$7 mg/kg/day (14 times the systemic exposure following a 35 mg/week human dose based on surface area, mg/m^2). In male rats, testicular and epididymal atrophy and inflammation were noted at 40 mg/kg/day (80 times the systemic exposure following a 35 mg/week human dose based on surface area, mg/m^2). Testicular atrophy was also noted in male rats after 13 weeks of treatment at oral doses of 16 mg/kg/day (approximately 30 times the systemic exposure following a 35 mg/week human dose based on surface area, mg/m^2). There was moderate-to-severe spermatid maturation block after 13 weeks in male dogs at an oral dose of 8 mg/kg/day (approximately 50 times the systemic exposure following a 35 mg/week human dose based on surface area, mg/m^2).

Pregnancy:

Pregnancy Category C: Survival of neonates was decreased in rats treated during gestation with oral doses of risedronate ≥16 mg/kg/day (approximately 30 times the systemic exposure following a 35 mg/week human dose based on surface area, mg/m^2). Body weight was decreased in neonates from dams treated with 80 mg/kg (approximately 160 times the 35 mg/week human dose based on surface area, mg/m^2). In rats treated during gestation, the number of fetuses exhibiting incomplete ossification of sternebrae or skull was statistically significantly increased at 7.1 mg/kg/day (approximately 14 times the 35 mg/week human dose based on surface area, mg/m^2). Both incomplete ossification and unossified sternebrae were increased in rats treated with oral doses ≥16 mg/kg/day (approximately 30 times the 35 mg/week human dose based on surface area, mg/m^2). A low incidence of cleft palate was observed in fetuses from female rats treated with oral doses ≥3.2 mg/kg/day (approximately 20 times the 35 mg/week human dose based on surface area, mg/m^2). The relevance of this finding to human use of ACTONEL is unclear. No significant fetal ossification effects were seen in rabbits treated with oral doses up to 10 mg/kg/day during gestation (40 times the 35 mg/week human dose based on surface area, mg/m^2). However, in rabbits treated with 10 mg/kg/day, 1 of 14 litters were aborted and 1 of 14 litters were delivered prematurely.

Similar to other bisphosphonates, treatment during mating and gestation with doses as low as 3.2 mg/kg/day (approximately 20 times the 35 mg/week human dose based on surface area, mg/m^2) has resulted in periparturient hypocalcemia and mortality in pregnant rats allowed to deliver.

Bisphosphonates are incorporated into the bone matrix, from which they are gradually released over periods of weeks to years. The amount of bisphosphonate incorporation into adult bone, and hence, the amount available for release back into the systemic circulation, is directly related to the dose and duration of bisphosphonate use. There are no data on fetal risk in humans. However, there is a theoretical risk of fetal harm, predominantly skeletal, if a woman becomes pregnant after completing a course of bisphosphonate therapy. The impact of variables such as time between cessation of bisphosphonate therapy to conception, the particular bisphosphonate used, and the route of administration (intravenous versus oral) on this risk has not been studied.

There are no adequate and well-controlled studies of ACTONEL in pregnant women. ACTONEL should be used during pregnancy only if the potential benefit justifies the potential risk to the mother and fetus.

Nursing Women:

Risedronate was detected in feeding pups exposed to lactating rats for a 24-hour period post-dosing, indicating a small degree of lacteal transfer. It is not known whether risedronate is excreted in human milk. Because many drugs are excreted in human milk and because of the potential for serious adverse reactions in nursing infants from bisphosphonates, a decision should be made whether to discontinue nursing or to discontinue the drug, taking into account the importance of the drug to the mother.

Pediatric Use:

ACTONEL

Safety and effectiveness in pediatric patients have not been established.

Geriatric Use:
ACTONEL
Of the patients receiving ACTONEL in postmenopausal osteoporosis studies (see **CLINICAL STUDIES**), 47% were between 65 and 75 years of age, and 17% were over 75. No overall differences in efficacy or safety were observed between these patients and younger patients but greater sensitivity of some older individuals cannot be ruled out.

CALCIUM
There are no published data that specifically compare the efficacy and safety between postmenopausal women above and below the age of 65 years.

Use in Men:
ACTONEL
The safety and effectiveness in men for the treatment of primary osteoporosis have not been established.

ADVERSE REACTIONS
ACTONEL
Osteoporosis:
ACTONEL has been studied in over 5700 patients enrolled in the Phase 3 glucocorticoid-induced osteoporosis clinical trials and in postmenopausal osteoporosis trials of up to 3-years duration. The overall adverse event profile of ACTONEL 5 mg in these studies was similar to that of placebo. Most adverse events were either mild or moderate and did not lead to discontinuation from the study. The incidence of serious adverse events in the placebo group was 24.9% and in the ACTONEL 5-mg group was 26.3%. The percentage of patients who withdrew from the study due to adverse events was 14.4% and 13.5% for the placebo and ACTONEL 5-mg groups, respectively. Table 4 lists adverse events from the Phase 3 osteoporosis trials reported in ≥2% of patients and in more ACTONEL-treated patients than placebo-treated patients. Adverse events are shown without attribution of causality.

Table 4
Adverse Events Occurring at a Frequency ≥2% and in More ACTONEL-Treated Patients than Placebo-Treated Patients Combined Phase 3 Osteoporosis Trials

Body System	Placebo % (N = 1914)	ACTONEL 5 mg % (N = 1916)
Body as a Whole		
Infection	29.7	29.9
Back Pain	23.6	26.1
Pain	13.1	13.6
Abdominal Pain	9.4	11.6
Neck Pain	4.5	5.3
Asthenia	4.3	5.1
Chest Pain	4.9	5.0
Neoplasm	3.0	3.3
Hernia	2.5	2.9

Table 4
Adverse Events Occurring at a Frequency ≥2% and in More ACTONEL-Treated Patients than Placebo-Treated Patients Combined Phase 3 Osteoporosis Trials

Body System	Placebo % (N = 1914)	ACTONEL 5 mg % (N = 1916)
Cardiovascular		
Hypertension	9.0	10.0
Cardiovascular Disorder	1.7	2.5
Angina Pectoris	2.4	2.5
Digestive		
Nausea	10.7	10.9
Diarrhea	9.6	10.6
Flatulence	4.2	4.6
Gastritis	2.3	2.5
Gastrointestinal Disorder	2.1	2.3
Rectal Disorder	1.9	2.2
Tooth Disorder	2.0	2.1
Hemic and Lymphatic		
Ecchymosis	4.0	4.3
Anemia	1.9	2.4
Musculoskeletal		
Arthralgia	21.1	23.7
Joint Disorder	5.4	6.8
Myalgia	6.3	6.6
Bone Pain	4.3	4.6
Bone Disorder	3.2	4.0
Leg Cramps	2.6	3.5
Bursitis	2.9	3.0
Tendon Disorder	2.5	3.0
Nervous		
Depression	6.2	6.8
Dizziness	5.4	6.4
Insomnia	4.5	4.7
Anxiety	3.0	4.3
Neuralgia	3.5	3.8
Vertigo	3.2	3.3
Hypertonia	2.1	2.2
Paresthesia	1.8	2.1
Respiratory		
Pharyngitis	5.0	5.8
Rhinitis	5.0	5.7
Dyspnea	3.2	3.8
Pneumonia	2.6	3.1
Skin and Appendages		
Rash	7.2	7.7
Pruritus	2.2	3.0
Skin Carcinoma	1.8	2.0
Special Senses		
Cataract	5.4	5.9
Conjunctivitis	2.8	3.1
Otitis Media	2.4	2.5

Table 4 Adverse Events Occurring at a Frequency ≥2% and in More ACTONEL-Treated Patients than Placebo-Treated Patients Combined Phase 3 Osteoporosis Trials		
Body System	Placebo % (N = 1914)	ACTONEL 5 mg % (N = 1916)
Urogenital		
Urinary Tract Infection	9.7	10.9
Cystitis	3.5	4.1

Duodenitis and glossitis have been reported uncommonly (0.1% to 1%). There have been rare reports (<0.1%) of abnormal liver function tests.

Laboratory Test Findings:

Asymptomatic and small decreases were observed in serum calcium and phosphorus levels. Overall, mean decreases of 0.8% in serum calcium and of 2.7% in phosphorus were observed at 6 months in patients receiving ACTONEL. Throughout the Phase 3 studies, serum calcium levels below 8 mg/dL were observed in 18 patients, 9 (0.5%) in each treatment arm (ACTONEL and placebo). Serum phosphorus levels below 2 mg/dL were observed in 14 patients, 11 (0.6%) treated with ACTONEL and 3 (0.2%) treated with placebo.

Endoscopic Findings:

ACTONEL clinical studies enrolled over 5700 patients, many with pre-existing gastrointestinal disease and concomitant use of NSAIDs or aspirin. Investigators were encouraged to perform endoscopies in any patients with moderate-to-severe gastrointestinal complaints, while maintaining the blind. These endoscopies were ultimately performed on equal numbers of patients between the treated and placebo groups [75 (14.5%) placebo; 75 (11.9%) ACTONEL]. Across treatment groups, the percentage of patients with normal esophageal, gastric, and duodenal mucosa on endoscopy was similar (20% placebo, 21% ACTONEL). The number of patients who withdrew from the studies due to the event prompting endoscopy was similar across treatment groups. Positive findings on endoscopy were also generally comparable across treatment groups. There was a higher number of reports of mild duodenitis in the ACTONEL group, however there were more duodenal ulcers in the placebo group. Clinically important findings (perforations, ulcers, or bleeding) among this symptomatic population were similar between groups (51% placebo; 39% ACTONEL).

Once-a-week Dosing:

In a 1-year, double-blind, multicenter study comparing ACTONEL 5-mg daily and ACTONEL 35-mg once a week in postmenopausal women, the overall safety and tolerability profiles of the 2 oral dosing regimens were similar. Table 5 lists the adverse events in ≥2% of patients from this trial. Events are shown without attribution of causality.

Table 5
Adverse Events Occurring in ≥ 2% of Patients of Either Treatment Group in the Daily vs. Weekly Osteoporosis Treatment Study in Postmenopausal Women

Body System	5 mg Daily ACTONEL % (N = 480)	35 mg Weekly ACTONEL % (N = 485)
Body as a Whole		
Infection	19.0	20.6
Accidental Injury	10.6	10.7
Pain	7.7	9.9
Back Pain	9.2	8.7
Flu Syndrome	7.1	8.5
Abdominal Pain	7.3	7.6
Headache	7.3	7.2
Overdose	6.9	6.8
Asthenia	3.5	5.4
Chest Pain	2.3	2.7
Allergic Reaction	1.9	2.5
Neoplasm	0.8	2.1
Neck Pain	2.7	1.2
Cardiovascular System		
Hypertension	5.8	4.9
Syncope	0.6	2.1
Vasodilatation	2.3	1.4
Digestive System		
Constipation	12.5	12.2
Dyspepsia	6.9	7.6
Nausea	8.5	6.2
Diarrhea	6.3	4.9
Gastroenteritis	3.8	3.5
Flatulence	3.3	3.1
Colitis	0.8	2.5
Gastrointestinal Disorder	1.9	2.5
Vomiting	1.9	2.5
Dry Mouth	2.5	1.4
Metabolic and Nutritional Disorders		
Peripheral Edema	4.2	1.6
Musculoskeletal System		
Arthralgia	11.5	14.2
Traumatic Bone Fracture	5.0	6.4
Myalgia	4.6	6.2
Arthritis	4.8	4.1

Table 5
Adverse Events Occurring in ≥ 2% of Patients of Either Treatment Group in the Daily vs. Weekly Osteoporosis Treatment Study in Postmenopausal Women

Body System	5 mg Daily ACTONEL % (N = 480)	35 mg Weekly ACTONEL % (N = 485)
Bursitis	1.3	2.5
Bone Pain	2.9	1.4
Nervous System		
Dizziness	5.8	4.9
Anxiety	0.6	2.7
Depression	2.3	2.3
Vertigo	2.1	1.6
Respiratory System		
Bronchitis	2.3	4.9
Sinusitis	4.6	4.5
Pharyngitis	4.6	2.9
Cough Increased	3.1	2.5
Pneumonia	0.8	2.5
Rhinitis	2.3	2.1
Skin and Appendages		
Rash	3.1	4.1
Pruritus	1.9	2.3
Special Senses		
Cataract	2.9	1.9
Urogenital System		
Urinary Tract Infection	2.9	5.2

Post-marketing Experience:
Very rare hypersensitivity and skin reactions have been reported, including angioedema, generalized rash and bullous skin reactions, some severe.
Musculoskeletal: bone, joint, or muscle pain, rarely described as severe or incapacitating (see **PRECAUTIONS**, Musculoskeletal Pain).

CALCIUM
Calcium carbonate may cause gastrointestinal adverse effects such as constipation, flatulence, nausea, abdominal pain, and bloating. Administration of calcium may increase the risk of kidney stones, particularly in patients with a history of this condition (see **PRECAUTIONS**).

OVERDOSAGE
ACTONEL
Decreases in serum calcium and phosphorus following substantial overdose may be expected in some patients. Signs and symptoms of hypocalcemia may also occur in some of these patients.

Milk or antacids containing calcium should be given to bind ACTONEL and reduce absorption of the drug.

In cases of substantial overdose, gastric lavage may be considered to remove unabsorbed drug. Standard procedures that are effective for treating hypocalcemia, including the administration of calcium intravenously, would be expected to restore physiologic amounts of ionized calcium and to relieve signs and symptoms of hypocalcemia.

Lethality after single oral doses was seen in female rats at 903 mg/kg and male rats at 1703 mg/kg. The minimum lethal dose in mice and rabbits was 4000 mg/kg and 1000 mg/kg. These values represent >1000 times the 35 mg/week human dose based on surface area (mg/m^2).

CALCIUM

Because of its limited intestinal absorption, overdosage with calcium carbonate is unlikely. However, prolonged use of very high doses can lead to hypercalcemia. Clinical manifestations of hypercalcemia may include anorexia, thirst, nausea, vomiting, constipation, abdominal pain, muscle weakness, fatigue, mental disturbances, polydipsia, polyuria, bone pain, nephrocalcinosis, renal calculi and in severe cases, cardiac arrhythmias.

Treatment: Calcium should be discontinued. Other therapies that may be contributing to the condition, such as thiazide diuretics, lithium, vitamin A, vitamin D and cardiac glycosides should also be discontinued. Gastric emptying of any residual calcium should be considered. Rehydration, and, according to severity, isolated or combined treatment with loop diuretics, bisphosphonates, calcitonin and corticosteroids should also be considered. Serum electrolytes, renal function and vital signs must be monitored.

DOSAGE AND ADMINISTRATION

Treatment and Prevention of Postmenopausal Osteoporosis (see INDICATIONS AND USAGE):

<u>One 35 mg Actonel tablet orally</u>, taken once a week (Day 1 of the 7-day treatment cycle):

ACTONEL should be taken at least 30 minutes before the first food or drink of the day other than water. Actonel should not be taken at the same time as other medications, including calcium.

To facilitate delivery to the stomach, ACTONEL should be swallowed while the patient is in an upright position and with a full glass of plain water (6 to 8 oz). Patients should not lie down for 30 minutes after taking the medication (see **PRECAUTIONS, General**). ACTONEL is not recommended for use in patients with severe renal impairment (creatinine clearance <30 mL/min). No dosage adjustment is necessary in patients with a creatinine clearance ≥30 mL/min or in the elderly.

<u>One 1250 mg calcium carbonate tablet (500 mg elemental calcium) orally</u>, taken with food daily on each of the remaining six days (Days 2 through 7 of the 7-day treatment cycle):

> The recommended total (diet and otherwise) daily calcium intake in postmenopausal women is 1200 mg of elemental calcium. If patients need calcium in excess of that provided by ACTONEL with CALCIUM, this should be taken with food at a separate time of day.

Patients should receive additional vitamin D if dietary intake is inadequate (see **PRECAUTIONS, General**). Co-administration of calcium tablets and calcium-, aluminum-, and magnesium-containing medications may interfere with the absorption of ACTONEL (see **Drug Interactions**).

ACTONEL with CALCIUM is not recommended for use in patients with severe renal impairment (creatinine clearance <30 mL/min). No dosage adjustment is necessary in patients with a creatinine clearance ≥ 30 mL/min or in the elderly.

HOW SUPPLIED

ACTONEL with CALCIUM is supplied in blister packages containing a 28-day course of therapy.

Four Actonel Tablets:
35 mg film-coated, oval, orange tablets with RSN on 1 face and 35 mg on the other

Twenty-four Calcium Carbonate Tablets, USP:
1250 mg calcium carbonate (equivalent to 500 mg elemental calcium) film-coated, oval, light blue tablets with NE 2 engraved on both faces

NDC 0149-0475-01

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

Actonel sold under U.S. patent No. 5,583,122; 5,935,602; 5,994,329; 6,015,801; 6,047,829; 6,096,342; 6,165,513; 6,225,294; 6,410,520; 6,432,932; 6,465,443; and 6,562,974.

Actonel mfg. by: Procter & Gamble Pharmaceuticals, Inc.
Cincinnati, OH 45202, or
OSG Norwich Pharmaceuticals, Inc.
North Norwich, NY 13814

Calcium mfg. by: OSG Norwich Pharmaceuticals, Inc.
North Norwich, NY 13814

Dist. by: Procter & Gamble Pharmaceuticals, Inc., TM Owner
Cincinnati, OH 45202

Marketed with: Aventis Pharmaceuticals, Inc.
Bridgewater, NJ 08807

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