HIGHLIGHTS OF PRESCRIBING INFORMATION
These highlights do not include all the information needed to use AVANDIA safely and effectively. See full prescribing information for AVANDIA.

AVANDIA (rosiglitazone maleate tablets), for oral use
Initial U.S. Approval: 1999

WARNING: CONGESTIVE HEART FAILURE
See full prescribing information for complete boxed warning.

- **Thiazolidinediones, including rosiglitazone, cause or exacerbate congestive heart failure in some patients (5.1). After initiation of AVANDIA, and after dose increases, observe patients carefully for signs and symptoms of heart failure (including excessive, rapid weight gain; dyspnea; and/or edema). If these signs and symptoms develop, the heart failure should be managed according to current standards of care. Furthermore, discontinuation or dose reduction of AVANDIA must be considered.**
- **AVANDIA is not recommended in patients with symptomatic heart failure. Initiation of AVANDIA in patients with established NYHA Class III or IV heart failure is contraindicated. (4, 5.1)**

---------- INDICATIONS AND USAGE----------
AVANDIA is a thiazolidinedione antidiabetic agent indicated as an adjunct to diet and exercise to improve glycemic control in adults with type 2 diabetes mellitus. (1)
Important Limitations of Use:

- AVANDIA should not be used in patients with type 1 diabetes mellitus or for the treatment of diabetic ketoacidosis. (1)
- Coadministration of AVANDIA and insulin is not recommended. (1, 5.1, 5.2)

----------DOSAGE AND ADMINISTRATION----------

- Start at 4 mg daily in single or divided doses; do not exceed 8 mg daily. (2)
- Dose increases should be accompanied by careful monitoring for adverse events related to fluid retention. (2)
- Do not initiate AVANDIA if the patient exhibits clinical evidence of active liver disease or increased serum transaminase levels. (2.1)

---------- DOSAGE FORMS AND STRENGTHS----------
Pentagonal, film-coated tablets in the following strengths: 2 mg and 4 mg (3)

---------- CONTRAINDICATIONS ----------

- Initiation in patients with established NYHA Class III or IV heart failure. (4)
- Hypersensitivity to rosiglitazone or any of the product's ingredients. (4)

----------WARNINGS AND PRECAUTIONS ----------

- Fluid retention, which may exacerbate or lead to heart failure, may occur. Combination use with insulin and use in congestive heart failure NYHA Class I and II may increase risk of other cardiovascular effects. (5.1)
- Meta-analysis of 52 mostly short-term trials suggested a potential risk of ischemic cardiovascular (CV) events relative to placebo, not confirmed in a long-term CV outcome trial versus metformin or sulfonylurea. (5.2)
- Dose-related edema (5.3) and weight gain (5.4) may occur.
- Measure liver enzymes prior to initiation and periodically thereafter. Do not initiate therapy in patients with increased baseline liver enzyme levels (ALT >2.5X upper limit of normal). Discontinue therapy if ALT levels remain >3X the upper limit of normal or if jaundice is observed. (5.5)
- Macular edema has been reported. (5.6)
- Increased incidence of bone fracture was observed in long-term trials. (5.7)
- Dose-related decreases in hemoglobin and hematocrit have occurred. (5.8)
- When used in combination with other hypoglycemic agents, a dose reduction of the concomitant agent may be necessary to reduce the risk of hypoglycemia. (5.9)

----------ADVERSE REACTIONS ----------
Common adverse reactions (>5%) reported in clinical trials without regard to causality were upper respiratory tract infection, injury, and headache. (6.1)

To report SUSPECTED ADVERSE REACTIONS, contact GlaxoSmithKline at 1-888-825-5249 or FDA at 1-800-FDA-1088 or www.fda.gov/medwatch.

----------DRUG INTERACTIONS ----------
Inhibitors of CYP2C8 (e.g., gemfibrozil) may increase rosiglitazone levels; inducers of CYP2C8 (e.g., rifampin) may decrease rosiglitazone levels. (7.1)

----------USE IN SPECIFIC POPULATIONS----------

- Females and males of reproductive potential: Advise premenopausal females of the potential for an unintended pregnancy. (8.3)
- Safety and effectiveness in children younger than 18 years have not been established. (8.4)

See 17 for PATIENT COUNSELING INFORMATION and Medication Guide.

Revised: 02/2019

FULL PRESCRIBING INFORMATION: CONTENTS*

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

FULL PRESCRIBING INFORMATION

WARNING: CONGESTIVE HEART FAILURE

- **Thiazolidinediones, including rosiglitazone, cause or exacerbate congestive heart failure in some patients *[see Warnings and Precautions (5.1)]*. After initiation of AVANDIA, and after dose increases, observe patients carefully for signs and symptoms of heart failure (including excessive, rapid weight gain; dyspnea; and/or edema). If these signs and symptoms develop, the heart failure should be managed according to current standards of care. Furthermore, discontinuation or dose reduction of AVANDIA must be considered.**
- **AVANDIA is not recommended in patients with symptomatic heart failure. Initiation of AVANDIA in patients with established NYHA Class III or IV heart failure is contraindicated. *[See Contraindications (4), Warnings and Precautions (5.1).]***

1 INDICATIONS AND USAGE

AVANDIA is a thiazolidinedione antidiabetic agent indicated as an adjunct to diet and exercise to improve glycemic control in adults with type 2 diabetes mellitus.

Important Limitations of Use:

- Due to its mechanism of action, AVANDIA is active only in the presence of endogenous insulin. Therefore, AVANDIA should not be used in patients with type 1 diabetes mellitus or for the treatment of diabetic ketoacidosis.
- The coadministration of AVANDIA and insulin is not recommended *[see Warnings and Precautions (5.1)]*.

2 DOSAGE AND ADMINISTRATION

AVANDIA may be administered at a starting dose of 4 mg either as a single daily dose or in 2 divided doses. For patients who respond inadequately following 8 to 12 weeks of treatment, as determined by reduction in fasting plasma glucose (FPG), the dose may be increased to 8 mg daily. Increases in the dose of AVANDIA should be accompanied by careful monitoring for adverse events related to fluid retention *[see Boxed Warning, Warnings and Precautions (5.1)]*. AVANDIA may be taken with or without food.

The total daily dose of AVANDIA should not exceed 8 mg.

Patients receiving AVANDIA in combination with other hypoglycemic agents may be at risk for hypoglycemia, and a reduction in the dose of the concomitant agent may be necessary.

2.1 Specific Patient Populations

Renal Impairment

No dosage adjustment is necessary when AVANDIA is used as monotherapy in patients with renal impairment. Since metformin is contraindicated in such patients, concomitant administration of metformin and AVANDIA is also contraindicated in patients with renal impairment.

Hepatic Impairment

Liver enzymes should be measured prior to initiating treatment with AVANDIA. Therapy with AVANDIA should not be initiated if the patient exhibits clinical evidence of active liver disease or increased serum transaminase levels (ALT >2.5X upper limit of normal at start of therapy). After initiation of AVANDIA, liver enzymes should be monitored periodically per the clinical judgment of the healthcare professional. *[See Warnings and Precautions (5.5), Clinical Pharmacology (12.3).]*

Pediatric

Data are insufficient to recommend pediatric use of AVANDIA *[see Use in Specific Populations (8.4)]*.

3 DOSAGE FORMS AND STRENGTHS

Pentagonal film-coated TILTAB tablet contains rosiglitazone as the maleate as follows:

- 2 mg – pink, debossed with GSK on one side and 2 on the other
- 4 mg – orange, debossed with GSK on one side and 4 on the other

4 CONTRAINDICATIONS

- Initiation of AVANDIA in patients with established New York Heart Association (NYHA) Class III or IV heart failure is contraindicated *[see Boxed Warning]*.
- Use in patients with a history of a hypersensitivity reaction to rosiglitazone or any of the product's ingredients.

5 WARNINGS AND PRECAUTIONS

5.1 Cardiac Failure

AVANDIA, like other thiazolidinediones, alone or in combination with other antidiabetic agents, can cause fluid retention, which may exacerbate or lead to heart failure. Patients should be observed for signs and symptoms of heart failure. If these signs and symptoms develop, the heart failure should be managed according to current standards of care. Furthermore, discontinuation or dose reduction of rosiglitazone must be considered *[see Boxed Warning]*.

Patients with congestive heart failure (CHF) NYHA Class I and II treated with AVANDIA have

an increased risk of cardiovascular events. A 52-week, double-blind, placebo-controlled, echocardiographic trial was conducted in 224 patients with type 2 diabetes mellitus and NYHA Class I or II CHF (ejection fraction ≤45%) on background antidiabetic and CHF therapy. An independent committee conducted a blinded evaluation of fluid-related events (including congestive heart failure) and cardiovascular hospitalizations according to predefined criteria (adjudication). Separate from the adjudication, other cardiovascular adverse events were reported by investigators. Although no treatment difference in change from baseline of ejection fractions was observed, more cardiovascular adverse events were observed following treatment with AVANDIA compared with placebo during the 52-week trial (Table 1).

Table 1. Emergent Cardiovascular Adverse Events in Patients with Congestive Heart Failure (NYHA Class I and II) Treated with AVANDIA or Placebo (in Addition to Background Antidiabetic and CHF Therapy)

Events	AVANDIA n = 110 n (%)	Placebo n = 114 n (%)
Adjudicated		
Cardiovascular deaths	5 (5%)	4 (4%)
CHF worsening	7 (6%)	4 (4%)
– with overnight hospitalization	5 (5%)	4 (4%)
– without overnight hospitalization	2 (2%)	0 (0%)
New or worsening edema	28 (25%)	10 (9%)
New or worsening dyspnea	29 (26%)	19 (17%)
Increases in CHF medication	36 (33%)	20 (18%)
Cardiovascular hospitalization[a]	21 (19%)	15 (13%)
Investigator-reported, non-adjudicated		
Ischemic adverse events	10 (9%)	5 (4%)
– Myocardial infarction	5 (5%)	2 (2%)
– Angina	6 (5%)	3 (3%)

[a] Includes hospitalization for any cardiovascular reason.

In a long-term, cardiovascular outcome trial, Rosiglitazone Evaluated for Cardiac Outcomes and Regulation of Glycemia in Diabetes (RECORD), in patients with type 2 diabetes *[see Adverse Reactions (6.1)]*, the incidence of heart failure was higher in patients treated with AVANDIA (2.7% [61/2,220] compared with active control 1.3% [29/2,227], HR 2.10 [95% CI: 1.35, 3.27]).

Initiation of AVANDIA in patients with established NYHA Class III or IV heart failure is contraindicated. AVANDIA is not recommended in patients with symptomatic heart failure. *[See Boxed Warning.]*

Patients experiencing acute coronary syndromes have not been studied in controlled clinical

trials. In view of the potential for development of heart failure in patients having an acute coronary event, initiation of AVANDIA is not recommended for patients experiencing an acute coronary event, and discontinuation of AVANDIA during this acute phase should be considered.

Patients with NYHA Class III and IV cardiac status (with or without CHF) have not been studied in controlled clinical trials. AVANDIA is not recommended in patients with NYHA Class III and IV cardiac status.

Congestive Heart Failure during Coadministration of AVANDIA with Insulin

In trials in which AVANDIA was added to insulin, AVANDIA increased the risk of congestive heart failure. Coadministration of AVANDIA and insulin is not recommended. *[See Indications and Usage (1), Warnings and Precautions (5.2).]*

In 7 controlled, randomized, double-blind trials which had durations from 16 to 26 weeks and which were included in a meta-analysis *[see Warnings and Precautions (5.2)]*, patients with type 2 diabetes mellitus were randomized to coadministration of AVANDIA and insulin (n = 1,018) or insulin (n = 815). In these 7 trials, AVANDIA was added to insulin. These trials included patients with long-standing diabetes (median duration of 12 years) and a high prevalence of pre-existing medical conditions, including peripheral neuropathy, retinopathy, ischemic heart disease, vascular disease, and congestive heart failure. The total number of patients with emergent congestive heart failure was 23 (2.3%) and 8 (1.0%) in the group receiving AVANDIA plus insulin and the insulin group, respectively.

Heart Failure in Observational Studies of Elderly Diabetic Patients Comparing AVANDIA with Pioglitazone

Three observational studies in elderly diabetic patients (aged 65 years and older) found that AVANDIA statistically significantly increased the risk of hospitalized heart failure compared with use of pioglitazone. One other observational study in patients with a mean age of 54 years, which also included an analysis in a subpopulation of patients aged >65 years, found no statistically significant increase in emergency department visits or hospitalization for heart failure in patients treated with AVANDIA compared with pioglitazone in the older subgroup.

5.2 Major Adverse Cardiovascular Events

Data from long-term, prospective, randomized, controlled clinical trials of AVANDIA versus metformin or sulfonylureas, particularly a cardiovascular outcome trial (RECORD), observed no difference in overall mortality or in major adverse cardiovascular events (MACE) and its components. A meta-analysis of mostly short-term trials suggested an increased risk for myocardial infarction with AVANDIA compared with placebo.

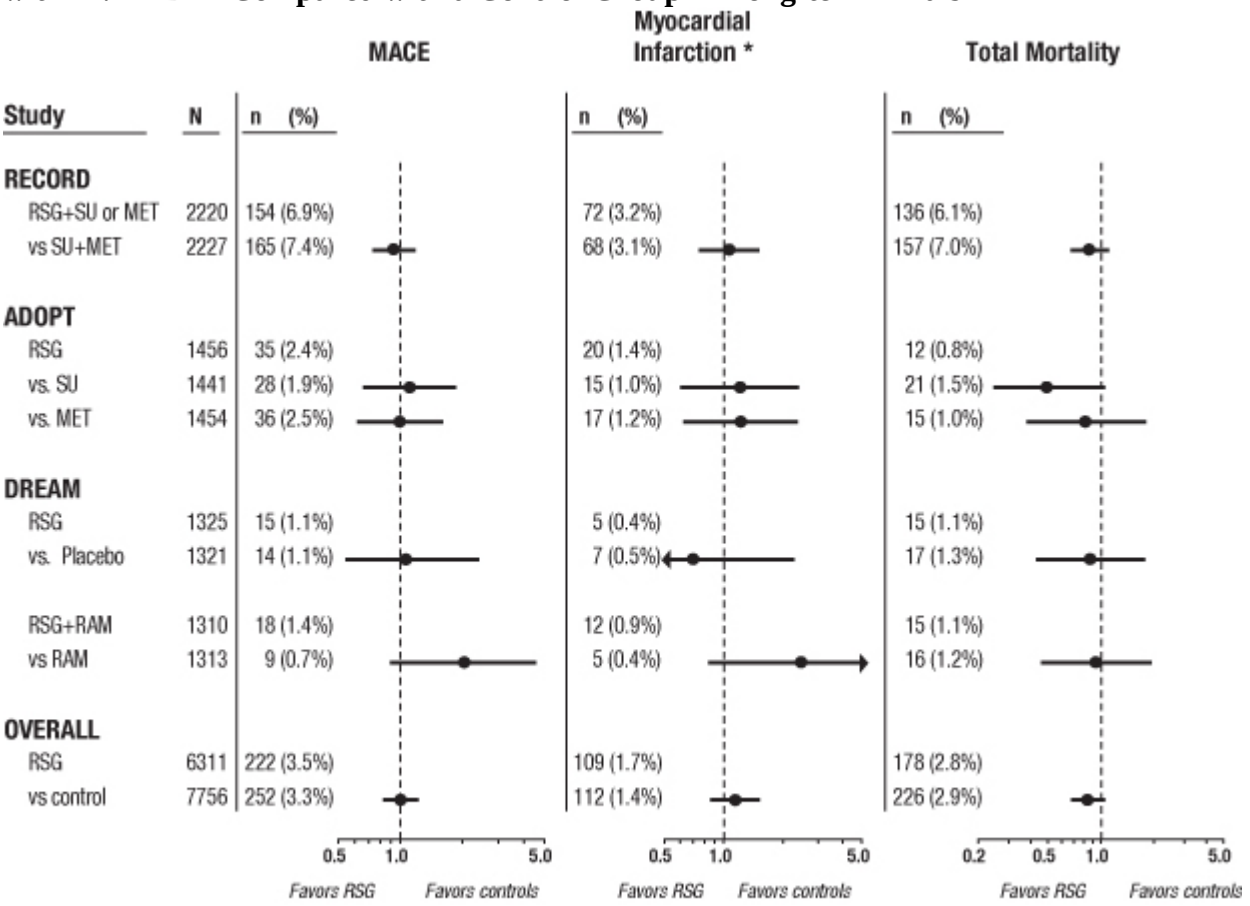
Cardiovascular Events in Large, Long-term, Prospective, Randomized, Controlled Trials of AVANDIA

RECORD, a prospectively designed cardiovascular outcome trial (mean follow-up 5.5 years;

4,447 patients), compared the addition of AVANDIA to metformin or a sulfonylurea (n = 2,220) with a control group of metformin plus sulfonylurea (n = 2,227) in patients with type 2 diabetes *[see Adverse Reactions (6.1)]*. Non-inferiority was demonstrated for the primary endpoint, cardiovascular hospitalization or cardiovascular death, for AVANDIA compared with control (HR 0.99 [95% CI: 0.85, 1.16]) demonstrating no overall increased risk in cardiovascular morbidity or mortality. The hazard ratios for total mortality and MACE were consistent with the primary endpoint and the 95% CI similarly excluded a 20% increase in risk for AVANDIA. The hazard ratios for the components of MACE were 0.72 (95% CI: 0.49, 1.06) for stroke, 1.14 (95% CI: 0.80, 1.63) for myocardial infarction, and 0.84 (95% CI: 0.59, 1.18) for cardiovascular death.

The results of RECORD are consistent with the findings of 2 earlier long-term, prospective, randomized, controlled clinical trials (each trial >3 years' duration; total of 9,620 patients) (Figure 1). In patients with impaired glucose tolerance (DREAM trial), although the incidence of cardiovascular events was higher among subjects who were randomized to AVANDIA in combination with ramipril than among subjects randomized to ramipril alone, no statistically significant differences were observed for MACE and its components between AVANDIA and placebo. In patients with type 2 diabetes who were initiating oral agent monotherapy (A Diabetes Outcome Progression Trial [ADOPT]), no statistically significant differences were observed for MACE and its components between AVANDIA and metformin or a sulfonylurea.

Figure 1. Hazard Ratios for the Risk of MACE, Myocardial Infarction, and Total Mortality with AVANDIA Compared with a Control Group in Long-term Trials



RSG = rosiglitazone; SU = sulfonylurea; MET = metformin; RAM = ramipril
* Myocardial infarction includes fatal and non-fatal MI plus sudden death

Cardiovascular Events in a Group of 52 Clinical Trials

In a meta-analysis of 52 double-blind, randomized, controlled clinical trials designed to assess glucose-lowering efficacy in type 2 diabetes (mean duration 6 months), a statistically significant increased risk of myocardial infarction with AVANDIA versus pooled comparators was observed (0.4% versus 0.3%; OR 1.8, [95% CI: 1.03, 3.25]). A statistically non-significant increased risk of MACE was observed with AVANDIA versus pooled comparators (OR 1.44, 95% CI: 0.95, 2.20). In the placebo-controlled trials, a statistically significant increased risk of myocardial infarction (0.4% versus 0.2%, OR 2.23 [95% CI: 1.14, 4.64]) and statistically non-significant increased risk of MACE (0.7% versus 0.5%, OR 1.53 [95% CI: 0.94, 2.54]) with AVANDIA were observed. In the active-controlled trials, there was no increased risk of myocardial infarction or MACE.

Mortality in Observational Studies of AVANDIA Compared with Pioglitazone

Three observational studies in elderly diabetic patients (aged 65 years and older) found that AVANDIA statistically significantly increased the risk of all-cause mortality compared with use

of pioglitazone. One observational study in patients with a mean age of 54 years found no difference in all-cause mortality between patients treated with AVANDIA compared with pioglitazone and reported similar results in the subpopulation of patients aged >65 years. One additional small, prospective, observational study found no statistically significant differences for CV mortality and all-cause mortality in patients treated with AVANDIA compared with pioglitazone.

5.3 Edema

AVANDIA should be used with caution in patients with edema. In a clinical trial in healthy volunteers who received 8 mg of AVANDIA once daily for 8 weeks, there was a statistically significant increase in median plasma volume compared with placebo.

Since thiazolidinediones, including rosiglitazone, can cause fluid retention, which can exacerbate or lead to congestive heart failure, AVANDIA should be used with caution in patients at risk for heart failure. Patients should be monitored for signs and symptoms of heart failure *[see Boxed Warning, Warnings and Precautions (5.1), Patient Counseling Information (17)]*.

In controlled clinical trials of patients with type 2 diabetes, mild to moderate edema was reported in patients treated with AVANDIA and may be dose related. Patients with ongoing edema were more likely to have adverse events associated with edema if started on combination therapy with insulin and AVANDIA *[see Adverse Reactions (6.1)]*.

5.4 Weight Gain

Dose-related weight gain was seen with AVANDIA alone and in combination with other hypoglycemic agents (Table 2). The mechanism of weight gain is unclear but probably involves a combination of fluid retention and fat accumulation.

In postmarketing experience, there have been reports of unusually rapid increases in weight and increases in excess of that generally observed in clinical trials. Patients who experience such increases should be assessed for fluid accumulation and volume-related events such as excessive edema and congestive heart failure *[see Boxed Warning]*.

Table 2. Weight Changes (kg) from Baseline at Endpoint during Clinical Trials

		Control Group		AVANDIA 4 mg	AVANDIA 8 mg
Monotherapy	**Duration**	**Control**	**Median (25^{th}, 75^{th} percentiles)**	**Median (25^{th}, 75^{th} percentiles)**	**Median (25^{th}, 75^{th} percentiles)**
	26 weeks	placebo	-0.9 (-2.8, 0.9) n = 210	1.0 (-0.9, 3.6) n = 436	3.1 (1.1, 5.8) n = 439
	52 weeks	sulfonylurea	2.0 (0, 4.0) n = 173	2.0 (-0.6, 4.0) n = 150	2.6 (0, 5.3) n = 157
Combination Therapy					
Sulfonylurea	24-26 weeks	sulfonylurea	0 (-1.0, 1.3) n = 1,155	2.2 (0.5, 4.0) n = 613	3.5 (1.4, 5.9) n = 841
Metformin	26 weeks	metformin	-1.4 (-3.2, 0.2) n = 175	0.8 (-1.0, 2.6) n = 100	2.1 (0, 4.3) n = 184
Insulin	26 weeks	insulin	0.9 (-0.5, 2.7) n = 162	4.1 (1.4, 6.3) n = 164	5.4 (3.4, 7.3) n = 150
Sulfonylurea + metformin	26 weeks	sulfonylurea + metformin	0.2 (-1.2, 1.6) n = 272	2.5 (0.8, 4.6) n = 275	4.5 (2.4, 7.3) n = 276

In a 4- to 6-year, monotherapy, comparative trial (ADOPT) in patients recently diagnosed with type 2 diabetes not previously treated with antidiabetic medication *[see Clinical Studies (14.1)]*, the median weight change (25^{th}, 75^{th} percentiles) from baseline at 4 years was 3.5 kg (0.0, 8.1) for AVANDIA, 2.0 kg (-1.0, 4.8) for glyburide, and -2.4 kg (-5.4, 0.5) for metformin.

In a 24-week trial in pediatric patients aged 10 to 17 years treated with AVANDIA 4 to 8 mg daily, a median weight gain of 2.8 kg (25^{th}, 75^{th} percentiles: 0.0, 5.8) was reported.

5.5 Hepatic Effects

Liver enzymes should be measured prior to the initiation of therapy with AVANDIA in all patients and periodically thereafter per the clinical judgment of the healthcare professional. Therapy with AVANDIA should not be initiated in patients with increased baseline liver enzyme levels (ALT >2.5X upper limit of normal). Patients with mildly elevated liver enzymes (ALT levels ≤2.5X upper limit of normal) at baseline or during therapy with AVANDIA should be evaluated to determine the cause of the liver enzyme elevation. Initiation of, or continuation of, therapy with AVANDIA in patients with mild liver enzyme elevations should proceed with caution and include close clinical follow-up, including liver enzyme monitoring, to determine if the liver enzyme elevations resolve or worsen. If at any time ALT levels increase to >3X the upper limit of normal in patients on therapy with AVANDIA, liver enzyme levels should be rechecked as soon as possible. If ALT levels remain >3X the upper limit of normal, therapy with

AVANDIA should be discontinued.

If any patient develops symptoms suggesting hepatic dysfunction, which may include unexplained nausea, vomiting, abdominal pain, fatigue, anorexia, and/or dark urine, liver enzymes should be checked. The decision whether to continue the patient on therapy with AVANDIA should be guided by clinical judgment pending laboratory evaluations. If jaundice is observed, drug therapy should be discontinued. *[See Adverse Reactions (6.2, 6.3).]*

5.6 Macular Edema

Macular edema has been reported in postmarketing experience in some diabetic patients who were taking AVANDIA or another thiazolidinedione. Some patients presented with blurred vision or decreased visual acuity, but some patients appear to have been diagnosed on routine ophthalmologic examination. Most patients had peripheral edema at the time macular edema was diagnosed. Some patients had improvement in their macular edema after discontinuation of their thiazolidinedione. Patients with diabetes should have regular eye exams by an ophthalmologist, per the Standards of Care of the American Diabetes Association. Additionally, any diabetic who reports any kind of visual symptom should be promptly referred to an ophthalmologist, regardless of the patient's underlying medications or other physical findings. *[See Adverse Reactions (6.1).]*

5.7 Fractures

Long-term trials (ADOPT and RECORD) show an increased incidence of bone fracture in patients, particularly female patients, taking AVANDIA *[see Adverse Reactions (6.1)]*. This increased incidence was noted after the first year of treatment and persisted during the course of the trial. The majority of the fractures in the women who received AVANDIA occurred in the upper arm, hand, and foot. These sites of fracture are different from those usually associated with postmenopausal osteoporosis (e.g., hip or spine). Other trials suggest that this risk may also apply to men, although the risk of fracture among women appears higher than that among men. The risk of fracture should be considered in the care of patients treated with AVANDIA, and attention given to assessing and maintaining bone health according to current standards of care.

5.8 Hematologic Effects

Decreases in mean hemoglobin and hematocrit occurred in a dose-related fashion in adult patients treated with AVANDIA *[see Adverse Reactions (6.2)]*. The observed changes may be related to the increased plasma volume observed with treatment with AVANDIA.

5.9 Diabetes and Blood Glucose Control

Patients receiving AVANDIA in combination with other hypoglycemic agents may be at risk for hypoglycemia, and a reduction in the dose of the concomitant agent may be necessary.

Periodic fasting blood glucose and HbA1c measurements should be performed to monitor therapeutic response.

6 ADVERSE REACTIONS

The following adverse reactions are discussed in more detail elsewhere in the labeling:

- Cardiac failure *[see Warnings and Precautions (5.1)]*
- Major adverse cardiovascular events *[see Warnings and Precautions (5.2)]*
- Edema *[see Warnings and Precautions (5.3)]*
- Weight gain *[see Warnings and Precautions (5.4)]*
- Hepatic effects *[see Warnings and Precautions (5.5)]*
- Macular edema *[see Warnings and Precautions (5.6)]*
- Fractures *[see Warnings and Precautions (5.7)]*
- Hematologic effects *[see Warnings and Precautions (5.8)]*

6.1 Clinical Trial Experience

Because clinical trials are conducted under widely varying conditions, adverse reaction rates observed in the clinical trials of a drug cannot be directly compared with rates in the clinical trials of another drug and may not reflect the rates observed in practice.

Adult Trials

In clinical trials, approximately 9,900 patients with type 2 diabetes have been treated with AVANDIA.

Short-term Trials of AVANDIA as Monotherapy and in Combination with Other Hypoglycemic Agents: The incidence and types of adverse events reported in short-term clinical trials of AVANDIA as monotherapy are shown in Table 3.

Table 3. Adverse Events (≥5% in any Treatment Group) Reported by Patients in Short-term[a] Double-blind Clinical Trials with AVANDIA as Monotherapy

Preferred Term	AVANDIA Monotherapy n = 2,526 %	Placebo n = 601 %	Metformin n = 225 %	Sulfonylureas[b] n = 626 %
Upper respiratory tract infection	9.9	8.7	8.9	7.3
Injury	7.6	4.3	7.6	6.1
Headache	5.9	5.0	8.9	5.4
Back pain	4.0	3.8	4.0	5.0
Hyperglycemia	3.9	5.7	4.4	8.1
Fatigue	3.6	5.0	4.0	1.9
Sinusitis	3.2	4.5	5.3	3.0
Diarrhea	2.3	3.3	15.6	3.0
Hypoglycemia	0.6	0.2	1.3	5.9

[a] Short-term trials ranged from 8 weeks to 1 year.

[b] Includes patients receiving glyburide (n = 514), gliclazide (n = 91), or glipizide (n = 21).

Overall, the types of adverse reactions without regard to causality reported when AVANDIA was used in combination with a sulfonylurea or metformin were similar to those during monotherapy with AVANDIA.

Events of anemia and edema tended to be reported more frequently at higher doses and were generally mild to moderate in severity and usually did not require discontinuation of treatment with AVANDIA.

In double-blind trials, anemia was reported in 1.9% of patients receiving AVANDIA as monotherapy compared with 0.7% on placebo, 0.6% on sulfonylureas, and 2.2% on metformin. Reports of anemia were greater in patients treated with a combination of AVANDIA and metformin (7.1%) and with a combination of AVANDIA and a sulfonylurea plus metformin (6.7%) compared with monotherapy with AVANDIA or in combination with a sulfonylurea (2.3%). Lower pre-treatment hemoglobin/hematocrit levels in patients enrolled in the metformin combination clinical trials may have contributed to the higher reporting rate of anemia in these trials *[see Adverse Reactions (6.2)]*.

In clinical trials, edema was reported in 4.8% of patients receiving AVANDIA as monotherapy compared with 1.3% on placebo, 1.0% on sulfonylureas, and 2.2% on metformin. The reporting rate of edema was higher for AVANDIA 8 mg in sulfonylurea combinations (12.4%) compared with other combinations, with the exception of insulin. Edema was reported in 14.7% of patients receiving AVANDIA in the insulin combination trials compared with 5.4% on insulin alone. Reports of new onset or exacerbation of congestive heart failure occurred at rates of 1% for

insulin alone, and 2% (4 mg) and 3% (8 mg) for insulin in combination with AVANDIA *[see Boxed Warning, Warnings and Precautions (5.1)]*.

In controlled combination therapy trials with sulfonylureas, mild to moderate hypoglycemic symptoms, which appear to be dose related, were reported. Few patients were withdrawn for hypoglycemia (<1%) and few episodes of hypoglycemia were considered to be severe (<1%). Hypoglycemia was the most frequently reported adverse event in the fixed-dose insulin combination trials, although few patients withdrew for hypoglycemia (4 of 408 for AVANDIA plus insulin and 1 of 203 for insulin alone). Rates of hypoglycemia, confirmed by capillary blood glucose concentration ≤50 mg/dL, were 6% for insulin alone and 12% (4 mg) and 14% (8 mg) for insulin in combination with AVANDIA. *[See Warnings and Precautions (5.9).]*

Long-term Trial of AVANDIA as Monotherapy: A 4- to 6-year trial (ADOPT) compared the use of AVANDIA (n = 1,456), glyburide (n = 1,441), and metformin (n = 1,454) as monotherapy in patients recently diagnosed with type 2 diabetes who were not previously treated with antidiabetic medication. Table 4 presents adverse reactions without regard to causality; rates are expressed per 100 patient-years (PY) exposure to account for the differences in exposure to trial medication across the 3 treatment groups.

In ADOPT, fractures were reported in a greater number of women treated with AVANDIA (9.3%, 2.7/100 patient-years) compared with glyburide (3.5%, 1.3/100 patient-years) or metformin (5.1%, 1.5/100 patient-years). The majority of the fractures in the women who received rosiglitazone were reported in the upper arm, hand, and foot. *[See Warnings and Precautions (5.7).]* The observed incidence of fractures for male patients was similar among the 3 treatment groups.

Table 4. On-Therapy Adverse Events (≥5 Events/100 Patient-Years [PY]) in any Treatment Group Reported in a 4- to 6-Year Clinical Trial of AVANDIA as Monotherapy (ADOPT)

Preferred Term	AVANDIA n = 1,456 PY = 4,954	Glyburide n = 1,441 PY = 4,244	Metformin n = 1,454 PY = 4,906
Nasopharyngitis	6.3	6.9	6.6
Back pain	5.1	4.9	5.3
Arthralgia	5.0	4.8	4.2
Hypertension	4.4	6.0	6.1
Upper respiratory tract infection	4.3	5.0	4.7
Hypoglycemia	2.9	13.0	3.4
Diarrhea	2.5	3.2	6.8

Long-term Trial of AVANDIA as Combination Therapy (RECORD): RECORD was a multicenter, randomized, open-label, non-inferiority trial in subjects with type 2 diabetes inadequately controlled on maximum doses of metformin or sulfonylurea (glyburide, gliclazide,

or glimepiride) to compare the time to reach the combined cardiovascular endpoint of cardiovascular death or cardiovascular hospitalization between patients randomized to the addition of AVANDIA versus metformin or sulfonylurea. The trial included patients who failed metformin or sulfonylurea monotherapy; those who failed metformin (n = 2,222) were randomized to receive either AVANDIA as add-on therapy (n = 1,117) or add-on sulfonylurea (n = 1,105), and those who failed sulfonylurea (n = 2,225) were randomized to receive either AVANDIA as add-on therapy (n = 1,103) or add-on metformin (n = 1,122). Patients were treated to target HbA1c ≤7% throughout the trial.

The mean age of patients in this trial was 58 years, 52% were male, and the mean duration of follow-up was 5.5 years. AVANDIA demonstrated non-inferiority to active control for the primary endpoint of cardiovascular hospitalization or cardiovascular death (HR 0.99, 95% CI: 0.85-1.16). There were no significant differences between groups for secondary endpoints with the exception of congestive heart failure (Table 5). The incidence of congestive heart failure was significantly greater among patients randomized to AVANDIA.

Table 5. Cardiovascular (CV) Outcomes for the RECORD Trial

Primary Endpoint	**AVANDIA n = 2,220**	**Active Control n = 2,227**	**Hazard Ratio**	**95% CI**
CV death or CV hospitalization	321	323	0.99	0.85-1.16
Secondary Endpoint				
All-cause death	136	157	0.86	0.68-1.08
CV death	60	71	0.84	0.59-1.18
Myocardial infarction	64	56	1.14	0.80-1.63
Stroke	46	63	0.72	0.49-1.06
CV death, myocardial infarction, or stroke	154	165	0.93	0.74-1.15
Heart failure	61	29	2.10	1.35-3.27

There was an increased incidence of bone fracture for subjects randomized to AVANDIA in addition to metformin or sulfonylurea compared with those randomized to metformin plus sulfonylurea (8.3% versus 5.3%) *[see Warnings and Precautions (5.7)]*. The majority of fractures were reported in the upper limbs and distal lower limbs. The risk of fracture appeared to be higher in females relative to control (11.5% versus 6.3%) than in males relative to control (5.3% versus 4.3%). Additional data are necessary to determine whether there is an increased risk of fracture in males after a longer period of follow-up.

Pediatric Trial

AVANDIA has been evaluated for safety in a single, active-controlled trial of pediatric patients with type 2 diabetes in which 99 were treated with AVANDIA and 101 were treated with metformin. The most common adverse reactions (>10%) without regard to causality for either AVANDIA or metformin were headache (17% versus 14%), nausea (4% versus 11%),

nasopharyngitis (3% versus 12%), and diarrhea (1% versus 13%). In this trial, one case of diabetic ketoacidosis was reported in the metformin group. In addition, there were 3 patients in the rosiglitazone group who had fasting plasma glucose (FPG) of approximately 300 mg/dL, 2+ ketonuria, and an elevated anion gap.

6.2 Laboratory Abnormalities

Hematologic

Decreases in mean hemoglobin and hematocrit occurred in a dose-related fashion in adult patients treated with AVANDIA (mean decreases in individual trials as much as 1.0 g/dL hemoglobin and as much as 3.3% hematocrit). The changes occurred primarily during the first 3 months following initiation of therapy with AVANDIA or following a dose increase in AVANDIA. The time course and magnitude of decreases were similar in patients treated with a combination of AVANDIA and other hypoglycemic agents or monotherapy with AVANDIA. Pre-treatment levels of hemoglobin and hematocrit were lower in patients in metformin combination trials and may have contributed to the higher reporting rate of anemia. In a single trial in pediatric patients, decreases in hemoglobin and hematocrit (mean decreases of 0.29 g/dL and 0.95%, respectively) were reported. Small decreases in hemoglobin and hematocrit have also been reported in pediatric patients treated with AVANDIA. White blood cell counts also decreased slightly in adult patients treated with AVANDIA. Decreases in hematologic parameters may be related to increased plasma volume observed with treatment with AVANDIA.

Lipids

Changes in serum lipids have been observed following treatment with AVANDIA in adults *[see Clinical Pharmacology (12.2)]*. Small changes in serum lipid parameters were reported in children treated with AVANDIA for 24 weeks.

Serum Transaminase Levels

In pre-approval clinical trials in 4,598 patients treated with AVANDIA (3,600 patient-years of exposure) and in a long-term 4- to 6-year trial in 1,456 patients treated with AVANDIA (4,954 patient-years exposure), there was no evidence of drug-induced hepatotoxicity.

In pre-approval, controlled trials, 0.2% of patients treated with AVANDIA had elevations in ALT >3X the upper limit of normal compared with 0.2% on placebo and 0.5% on active comparators. The ALT elevations in patients treated with AVANDIA were reversible. Hyperbilirubinemia was found in 0.3% of patients treated with AVANDIA compared with 0.9% treated with placebo and 1% in patients treated with active comparators. In pre-approval clinical trials, there were no cases of idiosyncratic drug reactions leading to hepatic failure. *[See Warnings and Precautions (5.5).]*

In the 4- to 6-year ADOPT trial, patients treated with AVANDIA (4,954 patient-years exposure), glyburide (4,244 patient-years exposure), or metformin (4,906 patient-years exposure), as

monotherapy, had the same rate of ALT increase to >3X upper limit of normal (0.3 per 100 patient-years exposure).

In the RECORD trial, patients randomized to AVANDIA in addition to metformin or sulfonylurea (10,849 patient-years exposure) and to metformin plus sulfonylurea (10,209 patient-years exposure) had a rate of ALT increase to ≥3X upper limit of normal of approximately 0.2 and 0.3 per 100 patient-years exposure, respectively.

6.3 Postmarketing Experience

In addition to adverse reactions reported from clinical trials, the events described below have been identified during post-approval use of AVANDIA. Because these events are reported voluntarily from a population of unknown size, it is not possible to reliably estimate their frequency or to always establish a causal relationship to drug exposure.

In patients receiving thiazolidinedione therapy, serious adverse events with or without a fatal outcome, potentially related to volume expansion (e.g., congestive heart failure, pulmonary edema, and pleural effusions) have been reported *[see Boxed Warning, Warnings and Precautions (5.1)]*.

There are postmarketing reports with AVANDIA of hepatitis, hepatic enzyme elevations to 3 or more times the upper limit of normal, and hepatic failure with and without fatal outcome, although causality has not been established.

There are postmarketing reports with AVANDIA of rash, pruritus, urticaria, angioedema, anaphylactic reaction, Stevens-Johnson syndrome *[see Contraindications (4)]*, and new onset or worsening diabetic macular edema with decreased visual acuity *[see Warnings and Precautions (5.6)]*.

7 DRUG INTERACTIONS

7.1 CYP2C8 Inhibitors and Inducers

An inhibitor of CYP2C8 (e.g., gemfibrozil) may increase the AUC of rosiglitazone and an inducer of CYP2C8 (e.g., rifampin) may decrease the AUC of rosiglitazone. Therefore, if an inhibitor or an inducer of CYP2C8 is started or stopped during treatment with rosiglitazone, changes in diabetes treatment may be needed based upon clinical response. *[See Clinical Pharmacology (12.3).]*

8 USE IN SPECIFIC POPULATIONS

8.1 Pregnancy

Risk Summary

Limited data with AVANDIA in pregnant women are not sufficient to determine a drug-associated risk for major birth defects or miscarriage. There are risks to the mother and fetus

associated with poorly controlled diabetes in pregnancy *(see Clinical Considerations).*

In animal reproduction studies, no adverse developmental effects were observed when rosiglitazone was administered to pregnant rats and rabbits during organogenesis at exposures up to 4 times the maximum recommended human dose (MRHD) of 8 mg daily *(see Data).*

The estimated background risk of major birth defects is 6% to 10% in women with pre-gestational diabetes with a HbA1c >7 and has been reported to be as high as 20% to 25% in women with a HbA1c >10. The estimated background risk of miscarriage for the indicated population is unknown. In the U.S. general population, the estimated background risk of major birth defects and miscarriage in clinically recognized pregnancies is 2% to 4% and 15% to 20%, respectively.

Clinical Considerations

Disease-Associated Maternal and/or Embryo/Fetal Risk: Poorly controlled diabetes in pregnancy increases the maternal risk for diabetic ketoacidosis, pre-eclampsia, spontaneous abortions, preterm delivery, and delivery complications. Poorly controlled diabetes increases the fetal risk for major birth defects, stillbirth, and macrosomia-related morbidity.

Data

Animal Data: Rosiglitazone administered during early pregnancy, organogenesis, and through lactation did not cause adverse effects in offspring of pregnant rats and rabbits at doses of 0.2 mg/kg and 15 mg/kg, respectively. These no-effect doses provide exposure of approximately 4 times the MRHD based on AUC. Higher exposures to rosiglitazone during organogenesis were associated with fetal death and growth retardation in rats and rabbits, and neonatal death (during lactation) and placental pathology in rats in the absence of maternal toxicity (exposures approximately 20 and 75 times MRHD based on AUC, respectively).

8.2 Lactation

Risk Summary

There are no data on the presence of rosiglitazone in human milk, the effects on the breastfed infant, or the effects on milk production. Rosiglitazone is present in rat milk; however, due to species-specific differences in lactation physiology, animal data may not reliably predict drug levels in human milk *(see Data).* The developmental and health benefits of breastfeeding should be considered along with the mother's clinical need for AVANDIA and any potential adverse effects on the breastfed infant from AVANDIA or the underlying maternal condition.

Data

Rosiglitazone was detected in the milk of lactating rats, with peak milk concentrations of approximately 33% that of maternal plasma concentrations occurring 1 hour post dose.

8.3 Females and Males of Reproductive Potential

Discuss the potential for unintended pregnancy with premenopausal women as therapy with AVANDIA, like other thiazolidinediones, may result in ovulation in some anovulatory women.

8.4 Pediatric Use

After placebo run-in including diet counseling, children with type 2 diabetes mellitus, aged 10 to 17 years and with a baseline mean body mass index (BMI) of 33 kg/m^2, were randomized to treatment with 2 mg twice daily of AVANDIA (n = 99) or 500 mg twice daily of metformin (n = 101) in a 24-week, double-blind clinical trial. As expected, FPG decreased in patients naïve to diabetes medication (n = 104) and increased in patients withdrawn from prior medication (usually metformin) (n = 90) during the run-in period. After at least 8 weeks of treatment, 49% of patients treated with AVANDIA and 55% of metformin-treated patients had their dose doubled if FPG >126 mg/dL. For the overall intent-to-treat population, at Week 24, the mean change from baseline in HbA1c was -0.14% with AVANDIA and -0.49% with metformin. There was an insufficient number of patients in this trial to establish statistically whether these observed mean treatment effects were similar or different. Treatment effects differed for patients naïve to therapy with antidiabetic drugs and for patients previously treated with antidiabetic therapy (Table 6).

Table 6. Week 24 FPG and HbA1c Change from Baseline Last-Observation—Carried Forward in Children with Baseline HbA1c >6.5%

Parameter	Naïve Patients		Previously-treated Patients	
	Metformin n = 40	Rosiglitazone n = 45	Metformin n = 43	Rosiglitazone n = 32
FPG (mg/dL)				
Baseline (mean)	170	165	221	205
Change from baseline (mean)	-21	-11	-33	-5
Adjusted treatment difference[a] (rosiglitazone–metformin)[b] (95% CI)		8 (-15, 30)		21 (-9, 51)
% of patients with ≥30 mg/dL decrease from baseline	43%	27%	44%	28%
HbA1c (%)				
Baseline (mean)	8.3	8.2	8.8	8.5
Change from baseline (mean)	-0.7	-0.5	-0.4	0.1
Adjusted treatment difference[a] (rosiglitazone–metformin)[b] (95% CI)		0.2 (-0.6, 0.9)		0.5 (-0.2, 1.3)
% of patients with ≥0.7% decrease from baseline	63%	52%	54%	31%

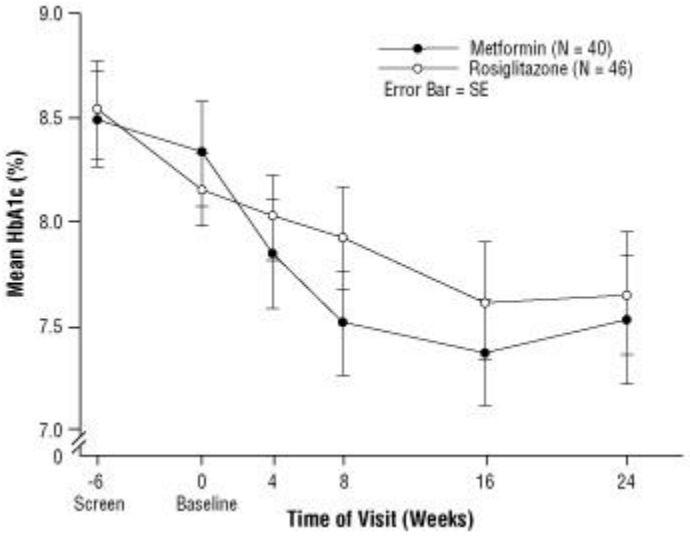
[a] Change from baseline means are least squares means adjusting for baseline HbA1c, gender, and region.

[b] Positive values for the difference favor metformin.

Treatment differences depended on baseline BMI or weight such that the effects of AVANDIA and metformin appeared more closely comparable among heavier patients. The median weight gain was 2.8 kg with rosiglitazone and 0.2 kg with metformin *[see Warnings and Precautions (5.4)]*. Fifty-four percent of patients treated with rosiglitazone and 32% of patients treated with metformin gained ≥2 kg, and 33% of patients treated with rosiglitazone and 7% of patients treated with metformin gained ≥5 kg on trial.

Adverse events observed in this trial are described in *Adverse Reactions (6.1)*.

Figure 2. Mean HbA1c over Time in a 24-Week Trial of AVANDIA and Metformin in Pediatric Patients — Drug-Naïve Subgroup



8.5 Geriatric Use

Results of the population pharmacokinetic analysis showed that age does not significantly affect the pharmacokinetics of rosiglitazone *[see Clinical Pharmacology (12.3)]*. Therefore, no dosage adjustments are required for the elderly. In controlled clinical trials, no overall differences in safety and effectiveness between older (≥65 years) and younger (<65 years) patients were observed.

10 OVERDOSAGE

Limited data are available with regard to overdosage in humans. In clinical trials in volunteers, AVANDIA has been administered at single oral doses of up to 20 mg and was well tolerated. In the event of an overdose, appropriate supportive treatment should be initiated as dictated by the patient's clinical status.

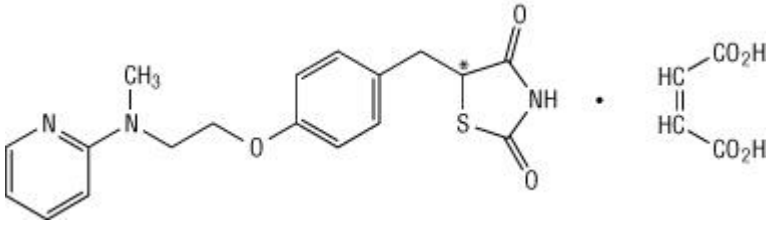
11 DESCRIPTION

AVANDIA (rosiglitazone maleate) is an oral antidiabetic agent which acts primarily by increasing insulin sensitivity. AVANDIA improves glycemic control while reducing circulating insulin levels.

Rosiglitazone maleate is not chemically or functionally related to the sulfonylureas, the biguanides, or the alpha-glucosidase inhibitors.

Chemically, rosiglitazone maleate is (±)-5-[[4-[2-(methyl-2-pyridinylamino)ethoxy]phenyl]methyl]-2,4-thiazolidinedione, (*Z*)-2-butenedioate (1:1) with a molecular weight of 473.52 (357.44 free base). The molecule has a single chiral center and is present as a racemate. Due to rapid interconversion, the enantiomers are functionally

indistinguishable. The structural formula of rosiglitazone maleate is:



The molecular formula is $C_{18}H_{19}N_3O_3S•C_4H_4O_4$. Rosiglitazone maleate is a white to off-white solid with a melting point range of 122° to 123°C. The pKa values of rosiglitazone maleate are 6.8 and 6.1. It is readily soluble in ethanol and a buffered aqueous solution with pH of 2.3; solubility decreases with increasing pH in the physiological range.

Each pentagonal film-coated TILTAB tablet contains rosiglitazone maleate equivalent to rosiglitazone 2 mg or 4 mg for oral administration. Inactive ingredients are: hypromellose 2910, lactose monohydrate, magnesium stearate, microcrystalline cellulose, polyethylene glycol 3000, sodium starch glycolate, titanium dioxide, triacetin, and 1 or more of the following: synthetic red and yellow iron oxides and talc.

12 CLINICAL PHARMACOLOGY

12.1 Mechanism of Action

Rosiglitazone, a member of the thiazolidinedione class of antidiabetic agents, improves glycemic control by improving insulin sensitivity. Rosiglitazone is a highly selective and potent agonist for the peroxisome proliferator-activated receptor-gamma (PPARγ). In humans, PPAR receptors are found in key target tissues for insulin action such as adipose tissue, skeletal muscle, and liver. Activation of PPARγ nuclear receptors regulates the transcription of insulin-responsive genes involved in the control of glucose production, transport, and utilization. In addition, PPARγ-responsive genes also participate in the regulation of fatty acid metabolism.

Insulin resistance is a common feature characterizing the pathogenesis of type 2 diabetes. The antidiabetic activity of rosiglitazone has been demonstrated in animal models of type 2 diabetes in which hyperglycemia and/or impaired glucose tolerance is a consequence of insulin resistance in target tissues. Rosiglitazone reduces blood glucose concentrations and reduces hyperinsulinemia in the ob/ob obese mouse, db/db diabetic mouse, and fa/fa fatty Zucker rat.

In animal models, the antidiabetic activity of rosiglitazone was shown to be mediated by increased sensitivity to insulin's action in the liver, muscle, and adipose tissues. Pharmacological studies in animal models indicate that rosiglitazone inhibits hepatic gluconeogenesis. The expression of the insulin-regulated glucose transporter GLUT-4 was increased in adipose tissue. Rosiglitazone did not induce hypoglycemia in animal models of type 2 diabetes and/or impaired glucose tolerance.

12.2 Pharmacodynamics

Patients with lipid abnormalities were not excluded from clinical trials of AVANDIA. In all 26-week controlled trials, across the recommended dose range, AVANDIA as monotherapy was associated with increases in total cholesterol, LDL, and HDL, and decreases in free fatty acids. These changes were statistically significantly different from placebo or glyburide controls (Table 7).

Increases in LDL occurred primarily during the first 1 to 2 months of therapy with AVANDIA and LDL levels remained elevated above baseline throughout the trials. In contrast, HDL continued to rise over time. As a result, the LDL/HDL ratio peaked after 2 months of therapy and then appeared to decrease over time. Because of the temporal nature of lipid changes, the 52-week, glyburide-controlled trial is most pertinent to assess long-term effects on lipids. At baseline, Week 26, and Week 52, mean LDL/HDL ratios were 3.1, 3.2, and 3.0, respectively, for AVANDIA 4 mg twice daily. The corresponding values for glyburide were 3.2, 3.1, and 2.9. The differences in change from baseline between AVANDIA and glyburide at Week 52 were statistically significant.

The pattern of LDL and HDL changes following therapy with AVANDIA in combination with other hypoglycemic agents were generally similar to those seen with AVANDIA as monotherapy.

The changes in triglycerides during therapy with AVANDIA were variable and were generally not statistically different from placebo or glyburide controls.

Table 7. Summary of Mean Lipid Changes in 26-Week, Placebo-Controlled and 52-Week, Glyburide-Controlled Monotherapy Trials

	Placebo-Controlled Trials Week 26			Glyburide-Controlled Trial Week 26 and Week 52			
	Placebo	AVANDIA		Glyburide Titration		AVANDIA 8 mg	
Parameter		4 mg Daily[a]	8 mg Daily[a]	Week 26	Week 52	Week 26	Week 52
Free fatty acids							
n	207	428	436	181	168	166	145
Baseline (mean)	18.1	17.5	17.9	26.4	26.4	26.9	26.6
% Change from baseline (mean)	+0.2%	-7.8%	-14.7%	-2.4%	-4.7%	-20.8%	-21.5%
LDL							
n	190	400	374	175	160	161	133
Baseline (mean)	123.7	126.8	125.3	142.7	141.9	142.1	142.1
% Change from baseline (mean)	+4.8%	+14.1%	+18.6%	-0.9%	-0.5%	+11.9%	+12.1%
HDL							
n	208	429	436	184	170	170	145
Baseline (mean)	44.1	44.4	43.0	47.2	47.7	48.4	48.3
% Change from baseline (mean)	+8.0%	+11.4%	+14.2%	+4.3%	+8.7%	+14.0%	+18.5%

[a] Once-daily and twice-daily dosing groups were combined.

12.3 Pharmacokinetics

Maximum plasma concentration (C_{max}) and the area under the curve (AUC) of rosiglitazone increase in a dose-proportional manner over the therapeutic dose range (Table 8). The elimination half-life is 3 to 4 hours and is independent of dose.

Table 8. Mean (SD) Pharmacokinetic Parameters for Rosiglitazone following Single Oral Doses (N = 32)

Parameter	1 mg Fasting	2 mg Fasting	8 mg Fasting	8 mg Fed
$AUC_{0\text{-}inf}$ (ng.h/mL)	358 (112)	733 (184)	2,971 (730)	2,890 (795)
C_{max} (ng/mL)	76 (13)	156 (42)	598 (117)	432 (92)
$t_{½}$ (h)	3.16 (0.72)	3.15 (0.39)	3.37 (0.63)	3.59 (0.70)
CL/F (L/h)	3.03 (0.87)	2.89 (0.71)	2.85 (0.69)	2.97 (0.81)

AUC = area under the curve; C_{max} = maximum concentration; $t_{½}$ = terminal half-life; CL/F = Oral clearance.

Absorption

The absolute bioavailability of rosiglitazone is 99%. Peak plasma concentrations are observed about 1 hour after dosing. Administration of rosiglitazone with food resulted in no change in overall exposure (AUC), but there was an approximately 28% decrease in C_{max} and a delay in T_{max} (1.75 hours). These changes are not likely to be clinically significant; therefore, AVANDIA may be administered with or without food.

Distribution

The mean (CV%) oral volume of distribution (Vss/F) of rosiglitazone is approximately 17.6 (30%) liters, based on a population pharmacokinetic analysis. Rosiglitazone is approximately 99.8% bound to plasma proteins, primarily albumin.

Metabolism

Rosiglitazone is extensively metabolized with no unchanged drug excreted in the urine. The major routes of metabolism were N-demethylation and hydroxylation, followed by conjugation with sulfate and glucuronic acid. All the circulating metabolites are considerably less potent than parent and, therefore, are not expected to contribute to the insulin-sensitizing activity of rosiglitazone.

In vitro data demonstrate that rosiglitazone is predominantly metabolized by cytochrome P450 (CYP) isoenzyme 2C8, with CYP2C9 contributing as a minor pathway.

Excretion

Following oral or intravenous administration of [^{14}C]rosiglitazone maleate, approximately 64% and 23% of the dose was eliminated in the urine and in the feces, respectively. The plasma half-life of [^{14}C]related material ranged from 103 to 158 hours.

Population Pharmacokinetics in Patients with Type 2 Diabetes

Population pharmacokinetic analyses from 3 large clinical trials including 642 men and 405 women with type 2 diabetes (aged 35 to 80 years) showed that the pharmacokinetics of rosiglitazone are not influenced by age, race, smoking, or alcohol consumption. Both oral clearance (CL/F) and oral steady-state volume of distribution (Vss/F) were shown to increase with increases in body weight. Over the weight range observed in these analyses (50 to 150 kg), the range of predicted CL/F and Vss/F values varied by <1.7-fold and <2.3-fold, respectively. Additionally, rosiglitazone CL/F was shown to be influenced by both weight and gender, being lower (about 15%) in female patients.

Specific Populations

Geriatric Patients: Results of the population pharmacokinetic analysis (n = 716 <65 years; n = 331 ≥65 years) showed that age does not significantly affect the pharmacokinetics of rosiglitazone.

Male and Female Patients: Results of the population pharmacokinetics analysis showed that the mean oral clearance of rosiglitazone in female patients (n = 405) was approximately 6% lower compared with male patients of the same body weight (n = 642).

As monotherapy and in combination with metformin, AVANDIA improved glycemic control in both males and females. In metformin combination trials, efficacy was demonstrated with no gender differences in glycemic response.

In monotherapy trials, a greater therapeutic response was observed in females; however, in more obese patients, gender differences were less evident. For a given BMI, females tend to have a greater fat mass than males. Since the molecular target PPARγ is expressed in adipose tissues, this differentiating characteristic may account, at least in part, for the greater response to AVANDIA in females. Since therapy should be individualized, no dose adjustments are necessary based on gender alone.

Patients with Hepatic Impairment: Unbound oral clearance of rosiglitazone was significantly lower in patients with moderate to severe liver disease (Child-Pugh Class B/C) compared with healthy subjects. As a result, unbound C_{max} and $AUC_{0\text{-}inf}$ were increased 2- and 3-fold, respectively. Elimination half-life for rosiglitazone was about 2 hours longer in patients with liver disease, compared with healthy subjects.

Therapy with AVANDIA should not be initiated if the patient exhibits clinical evidence of active liver disease or increased serum transaminase levels (ALT >2.5X upper limit of normal) at baseline *[see Warnings and Precautions (5.5)]*.

Pediatric Patients: Pharmacokinetic parameters of rosiglitazone in pediatric patients were established using a population pharmacokinetic analysis with sparse data from 96 pediatric patients in a single pediatric clinical trial including 33 males and 63 females with ages ranging from 10 to 17 years (weights ranging from 35 to 178.3 kg). Population mean CL/F and V/F of

rosiglitazone were 3.15 L/h and 13.5 L, respectively. These estimates of CL/F and V/F were consistent with the typical parameter estimates from a prior adult population analysis.

Patients with Renal Impairment: There are no clinically relevant differences in the pharmacokinetics of rosiglitazone in patients with mild to severe renal impairment or in hemodialysis-dependent patients compared with subjects with normal renal function. No dosage adjustment is therefore required in such patients receiving AVANDIA. Since metformin is contraindicated in patients with renal impairment, coadministration of metformin with AVANDIA is contraindicated in these patients.

Racial and Ethnic Groups: Results of a population pharmacokinetic analysis including subjects of Caucasian, black, and other ethnic origins indicate that race has no influence on the pharmacokinetics of rosiglitazone.

Drug Interaction Studies

Drugs that Inhibit, Induce, or are Metabolized by Cytochrome P450: In vitro drug metabolism studies suggest that rosiglitazone does not inhibit any of the major P450 enzymes at clinically relevant concentrations. In vitro data demonstrate that rosiglitazone is predominantly metabolized by CYP2C8, and to a lesser extent, 2C9. AVANDIA (4 mg twice daily) was shown to have no clinically relevant effect on the pharmacokinetics of nifedipine and oral contraceptives (ethinyl estradiol and norethindrone), which are predominantly metabolized by CYP3A4.

Gemfibrozil: Concomitant administration of gemfibrozil (600 mg twice daily), an inhibitor of CYP2C8, and rosiglitazone (4 mg once daily) for 7 days increased rosiglitazone AUC by 127%, compared with the administration of rosiglitazone (4 mg once daily) alone. Given the potential for dose-related adverse events with rosiglitazone, a decrease in the dose of rosiglitazone may be needed when gemfibrozil is introduced *[see Drug Interactions (7.1)]*.

Rifampin: Rifampin administration (600 mg once a day), an inducer of CYP2C8, for 6 days is reported to decrease rosiglitazone AUC by 66%, compared with the administration of rosiglitazone (8 mg) alone *[see Drug Interactions (7.1)]*.[1]

Glyburide: AVANDIA (2 mg twice daily) taken concomitantly with glyburide (3.75 to 10 mg/day) for 7 days did not alter the mean steady-state 24-hour plasma glucose concentrations in diabetic patients stabilized on glyburide therapy. Repeat doses of AVANDIA (8 mg once daily) for 8 days in healthy adult Caucasian subjects caused a decrease in glyburide AUC and C_{max} of approximately 30%. In Japanese subjects, glyburide AUC and C_{max} slightly increased following coadministration of AVANDIA.

Glimepiride: Single oral doses of glimepiride in 14 healthy adult subjects had no clinically significant effect on the steady-state pharmacokinetics of AVANDIA. No clinically significant reductions in glimepiride AUC and C_{max} were observed after repeat doses of AVANDIA (8 mg once daily) for 8 days in healthy adult subjects.

Metformin: Concurrent administration of AVANDIA (2 mg twice daily) and metformin (500 mg twice daily) in healthy volunteers for 4 days had no effect on the steady-state pharmacokinetics of either metformin or rosiglitazone.

Acarbose: Coadministration of acarbose (100 mg three times daily) for 7 days in healthy volunteers had no clinically relevant effect on the pharmacokinetics of a single oral dose of AVANDIA.

Digoxin: Repeat oral dosing of AVANDIA (8 mg once daily) for 14 days did not alter the steady-state pharmacokinetics of digoxin (0.375 mg once daily) in healthy volunteers.

Warfarin: Repeat dosing with AVANDIA had no clinically relevant effect on the steady-state pharmacokinetics of warfarin enantiomers.

Ethanol: A single administration of a moderate amount of alcohol did not increase the risk of acute hypoglycemia in patients with type 2 diabetes mellitus treated with AVANDIA.

Ranitidine: Pre-treatment with ranitidine (150 mg twice daily for 4 days) did not alter the pharmacokinetics of either single oral or intravenous doses of rosiglitazone in healthy volunteers. These results suggest that the absorption of oral rosiglitazone is not altered in conditions accompanied by increases in gastrointestinal pH.

13 NONCLINICAL TOXICOLOGY

13.1 Carcinogenesis, Mutagenesis, Impairment of Fertility

Carcinogenesis

A 2-year carcinogenicity study was conducted in CD-1 mice at doses of 0.4, 1.5, and 6 mg/kg/day in the diet (highest dose equivalent to approximately 12 times human AUC at the MRHD). Sprague-Dawley rats were dosed for 2 years by oral gavage at doses of 0.05, 0.3, and 2 mg/kg/day (highest dose equivalent to approximately 10 and 20 times human AUC at the MRHD for male and female rats, respectively).

Rosiglitazone was not carcinogenic in the mouse. There was an increase in incidence of adipose hyperplasia in the mouse at doses ≥1.5 mg/kg/day (approximately 2 times human AUC at the MRHD). In rats, there was a significant increase in the incidence of benign adipose tissue tumors (lipomas) at doses ≥0.3 mg/kg/day (approximately 2 times human AUC at the MRHD). These proliferative changes in both species are considered due to the persistent pharmacological overstimulation of adipose tissue.

Mutagenesis

Rosiglitazone was not mutagenic or clastogenic in the in vitro bacterial assays for gene mutation, the in vitro chromosome aberration test in human lymphocytes, the in vivo mouse micronucleus test, and the in vivo/in vitro rat UDS assay.

Impairment of Fertility

Rosiglitazone had no effects on mating or fertility of male rats given up to 40 mg/kg/day (approximately 116 times the MRHD based on AUC). Rosiglitazone altered estrous cyclicity (2 mg/kg/day) and reduced fertility (40 mg/kg/day) of female rats in association with lower plasma levels of progesterone and estradiol (approximately 20 and 200 times the MRHD based on AUC, respectively). No such effects were noted at 0.2 mg/kg/day (approximately 4 times the MRHD based on AUC). In monkeys, rosiglitazone (0.6 and 4.6 mg/kg/day; approximately 3 and 15 times the MRHD based on AUC, respectively) reversibly diminished the follicular phase rise in serum estradiol with consequential reduction in the luteinizing hormone surge, lower luteal phase progesterone levels, and amenorrhea. The mechanism for these effects appears to be direct inhibition of ovarian steroidogenesis.

13.2 Animal Toxicology

Heart weights were increased in mice (3 mg/kg/day), rats (5 mg/kg/day), and dogs (2 mg/kg/day) with rosiglitazone treatment (approximately 5, 22, and 2 times the MRHD based on AUC, respectively). Morphometric measurement indicated cardiac ventricular hypertrophy, which may be due to increased cardiac work as a result of plasma volume expansion.

14 CLINICAL STUDIES

14.1 Monotherapy

In clinical trials, treatment with AVANDIA resulted in an improvement in glycemic control, as measured by FPG and HbA1c, with a concurrent reduction in insulin and C-peptide. Postprandial glucose and insulin were also reduced. This is consistent with the mechanism of action of AVANDIA as an insulin sensitizer.

The MRHD is 8 mg. Dose-ranging trials suggested that no additional benefit was obtained with a total daily dose of 12 mg.

Short-term Clinical Trials

A total of 2,315 patients with type 2 diabetes, previously treated with diet alone or antidiabetic medication(s), were treated with AVANDIA as monotherapy in 6 double-blind trials, which included two 26-week, placebo-controlled trials; one 52-week, glyburide-controlled trial; and 3 placebo-controlled, dose-ranging trials of 8 to 12 weeks' duration. Previous antidiabetic medication(s) were withdrawn and patients entered a 2- to 4-week placebo run-in period prior to randomization.

Two 26-week, double-blind, placebo-controlled trials, in patients with type 2 diabetes (n = 1,401) with inadequate glycemic control [mean baseline FPG approximately 228 mg/dL (101 to 425 mg/dL) and mean baseline HbA1c 8.9% (5.2% to 16.2%)], were conducted. Treatment with AVANDIA produced statistically significant improvements in FPG and HbA1c compared with baseline and relative to placebo. Data from one of these trials are summarized in

Table 9.

Table 9. Glycemic Parameters in a 26-Week, Placebo-Controlled Trial

Parameter	Placebo n = 173	AVANDIA 4 mg Once Daily n = 180	AVANDIA 2 mg Twice Daily n = 186	AVANDIA 8 mg Once Daily n = 181	AVANDIA 4 mg Twice Daily n = 187
FPG (mg/dL)					
Baseline (mean)	225	229	225	228	228
Change from baseline (mean)	8	-25	-35	-42	-55
Difference from placebo (adjusted mean)	–	-31[a]	-43[a]	-49[a]	-62[a]
% of patients with ≥30 mg/dL decrease from baseline	19%	45%	54%	58%	70%
HbA1c (%)					
Baseline (mean)	8.9	8.9	8.9	8.9	9.0
Change from baseline (mean)	0.8	0.0	-0.1	-0.3	-0.7
Difference from placebo (adjusted mean)	–	-0.8[a]	-0.9[a]	-1.1[a]	-1.5[a]
% of patients with ≥0.7% decrease from baseline	9%	28%	29%	39%	54%

[a] P <0.0001 compared with placebo.

When administered at the same total daily dose, AVANDIA was generally more effective in reducing FPG and HbA1c when administered in divided doses twice daily compared with once-daily doses. However, for HbA1c, the difference between the 4-mg once-daily and 2-mg twice-daily doses was not statistically significant.

Long-term Clinical Trials

Long-term maintenance of effect was evaluated in a 52-week, double-blind, glyburide-controlled trial in patients with type 2 diabetes. Patients were randomized to treatment with AVANDIA 2 mg twice daily (n = 195) or AVANDIA 4 mg twice daily (n = 189) or glyburide (n = 202) for 52 weeks. Patients receiving glyburide were given an initial dosage of either 2.5 mg/day or 5.0 mg/day. The dosage was then titrated in 2.5-mg/day increments over the next 12 weeks, to a maximum dosage of 15 mg/day in order to optimize glycemic control. Thereafter, the glyburide dose was kept constant.

The median titrated dose of glyburide was 7.5 mg. All treatments resulted in a statistically significant improvement in glycemic control from baseline (Figure 3 and Figure 4). At the end of Week 52, the reduction from baseline in FPG and HbA1c was -40.8 mg/dL and -0.53% with

AVANDIA 4 mg twice daily; -25.4 mg/dL and -0.27% with AVANDIA 2 mg twice daily; and -30.0 mg/dL and -0.72% with glyburide. For HbA1c, the difference between AVANDIA 4 mg twice daily and glyburide was not statistically significant at Week 52. The initial fall in FPG with glyburide was greater than with AVANDIA; however, this effect was less durable over time. The improvement in glycemic control seen with AVANDIA 4 mg twice daily at Week 26 was maintained through Week 52 of the trial.

Figure 3. Mean FPG over Time in a 52-Week, Glyburide-Controlled Trial

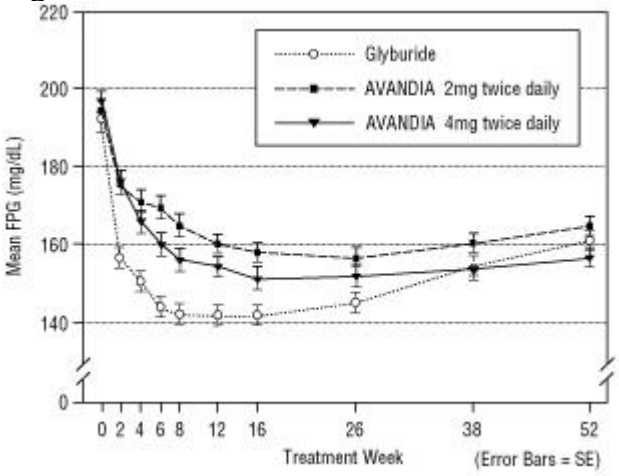
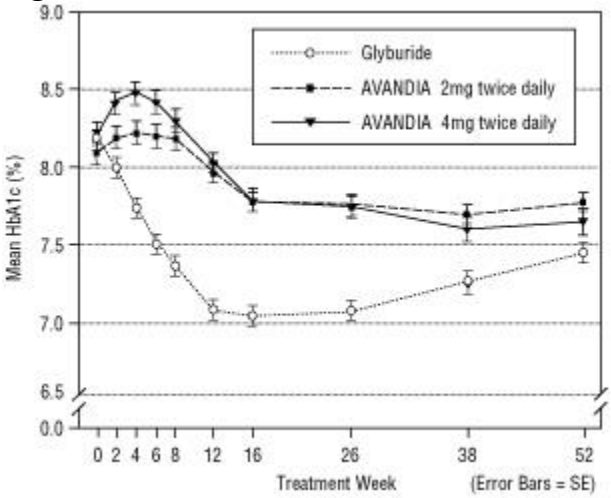


Figure 4. Mean HbA1c over Time in a 52-Week, Glyburide-Controlled Trial



Hypoglycemia was reported in 12.1% of glyburide-treated patients versus 0.5% (2 mg twice daily) and 1.6% (4 mg twice daily) of patients treated with AVANDIA. The improvements in glycemic control were associated with a mean weight gain of 1.75 kg and 2.95 kg for patients treated with 2 mg and 4 mg twice daily of AVANDIA, respectively, versus 1.9 kg in glyburide-treated patients. In patients treated with AVANDIA, C-peptide, insulin, pro-insulin, and pro-insulin split products were significantly reduced in a dose-ordered fashion, compared with an increase in the glyburide-treated patients.

The ADOPT trial was a multicenter, double-blind, controlled trial (N = 4,351) conducted over 4 to 6 years to compare the safety and efficacy of AVANDIA, metformin, and glyburide monotherapy in patients recently diagnosed with type 2 diabetes mellitus (≤3 years) inadequately controlled with diet and exercise. The mean age of patients in this trial was 57 years and the majority of patients (83%) had no known history of cardiovascular disease. The mean baseline FPG and HbA1c were 152 mg/dL and 7.4%, respectively. Patients were randomized to receive either AVANDIA 4 mg once daily, glyburide 2.5 mg once daily, or metformin 500 mg once daily, and doses were titrated to optimal glycemic control up to a maximum of 4 mg twice daily for AVANDIA, 7.5 mg twice daily for glyburide, and 1,000 mg twice daily for metformin. The primary efficacy outcome was time to consecutive FPG >180 mg/dL after at least 6 weeks of treatment at the maximum tolerated dose of study medication or time to inadequate glycemic control, as determined by an independent adjudication committee.

The cumulative incidence of the primary efficacy outcome at 5 years was 15% with AVANDIA, 21% with metformin, and 34% with glyburide (HR 0.68 [95% CI: 0.55, 0.85] versus metformin, HR 0.37 [95% CI: 0.30, 0.45] versus glyburide).

Cardiovascular and adverse event data (including effects on body weight and bone fracture) from ADOPT for AVANDIA, metformin, and glyburide are described in *Warnings and Precautions (5.2, 5.4, and 5.7)* and *Adverse Reactions (6.1)*, respectively. As with all medications, efficacy results must be considered together with safety information to assess the potential benefit and risk for an individual patient.

14.2 Combination with Metformin or Sulfonylurea

The addition of AVANDIA to either metformin or sulfonylurea resulted in significant reductions in hyperglycemia compared with either of these agents alone. These results are consistent with an additive effect on glycemic control when AVANDIA is used as combination therapy.

Combination with Metformin

A total of 670 patients with type 2 diabetes participated in two 26-week, randomized, double-blind, placebo-/active-controlled trials designed to assess the efficacy of AVANDIA in combination with metformin. AVANDIA, administered in either once-daily or twice-daily dosing regimens, was added to the therapy of patients who were inadequately controlled on a maximum dose (2.5 grams/day) of metformin.

In one trial, patients inadequately controlled on 2.5 grams/day of metformin (mean baseline FPG 216 mg/dL and mean baseline HbA1c 8.8%) were randomized to receive 4 mg of AVANDIA once daily, 8 mg of AVANDIA once daily, or placebo in addition to metformin. A statistically significant improvement in FPG and HbA1c was observed in patients treated with the combinations of metformin and 4 mg of AVANDIA once daily and 8 mg of AVANDIA once daily, versus patients continued on metformin alone (Table 10).

Table 10. Glycemic Parameters in a 26-Week Combination Trial of AVANDIA plus Metformin

Parameter	Metformin n = 113	AVANDIA 4 mg Once Daily + Metformin n = 116	AVANDIA 8 mg Once Daily + Metformin n = 110
FPG (mg/dL)			
Baseline (mean)	214	215	220
Change from baseline (mean)	6	-33	-48
Difference from metformin alone (adjusted mean)	–	-40[a]	-53[a]
% of patients with ≥30 mg/dL decrease from baseline	20%	45%	61%
HbA1c (%)			
Baseline (mean)	8.6	8.9	8.9
Change from baseline (mean)	0.5	-0.6	-0.8
Difference from metformin alone (adjusted mean)	–	-1.0[a]	-1.2[a]
% of patients with ≥0.7% decrease from baseline	11%	45%	52%

[a] *P* <0.0001 compared with metformin.

In a second 26-week trial, patients with type 2 diabetes inadequately controlled on 2.5 grams/day of metformin who were randomized to receive the combination of AVANDIA 4 mg twice daily and metformin (n = 105) showed a statistically significant improvement in glycemic control with a mean treatment effect for FPG of -56 mg/dL and a mean treatment effect for HbA1c of -0.8% over metformin alone. The combination of metformin and AVANDIA resulted in lower levels of FPG and HbA1c than either agent alone.

Patients who were inadequately controlled on a maximum dose (2.5 grams/day) of metformin and who were switched to monotherapy with AVANDIA demonstrated loss of glycemic control, as evidenced by increases in FPG and HbA1c. In this group, increases in LDL and VLDL were also seen.

Combination with a Sulfonylurea

A total of 3,457 patients with type 2 diabetes participated in ten 24- to 26-week randomized, double-blind, placebo/active-controlled trials and one 2-year double-blind, active-controlled trial in elderly patients designed to assess the efficacy and safety of AVANDIA in combination with a sulfonylurea. AVANDIA 2 mg, 4 mg, or 8 mg daily was administered, either once daily (3 trials) or in divided doses twice daily (7 trials), to patients inadequately controlled on a submaximal or

maximal dose of sulfonylurea.

In these trials, the combination of AVANDIA 4 mg or 8 mg daily (administered as a single dose or twice-daily divided doses) and a sulfonylurea significantly reduced FPG and HbA1c compared with placebo plus sulfonylurea or further up-titration of the sulfonylurea. Table 11 shows pooled data for 8 trials in which AVANDIA added to sulfonylurea was compared with placebo plus sulfonylurea.

Table 11. Glycemic Parameters in 24- to 26-Week Combination Trials of AVANDIA plus Sulfonylurea

Twice-Daily Divided Dosing (5 Trials)	Sulfonylurea n = 397	AVANDIA 2 mg Twice Daily + Sulfonylurea n = 497	Sulfonylurea n = 248	AVANDIA 4 mg Twice Daily + Sulfonylurea n = 346
FPG (mg/dL)				
Baseline (mean)	204	198	188	187
Change from baseline (mean)	11	-29	8	-43
Difference from sulfonylurea alone (adjusted mean)	–	-42[a]	–	-53[a]
% of patients with ≥30 mg/dL decrease from baseline	17%	49%	15%	61%
HbA1c (%)				
Baseline (mean)	9.4	9.5	9.3	9.6
Change from baseline (mean)	0.2	-1.0	0.0	-1.6
Difference from sulfonylurea alone (adjusted mean)	–	-1.1[a]	–	-1.4[a]
% of patients with ≥0.7% decrease from baseline	21%	60%	23%	75%
Once-Daily Dosing (3 Trials)	**Sulfonylurea n = 172**	**AVANDIA 4 mg Once Daily + Sulfonylurea n = 172**	**Sulfonylurea n = 173**	**AVANDIA 8 mg Once Daily + Sulfonylurea n = 176**
FPG (mg/dL)				
Baseline (mean)	198	206	188	192
Change from baseline (mean)	17	-25	17	-43
Difference from sulfonylurea alone (adjusted mean)	–	-47[a]	–	-66[a]
% of patients with ≥30 mg/dL decrease from baseline	17%	48%	19%	55%
HbA1c (%)				
Baseline (mean)	8.6	8.8	8.9	8.9
Change from baseline (mean)	0.4	-0.5	0.1	-1.2
Difference from sulfonylurea alone (adjusted mean)	–	-0.9[a]	–	-1.4[a]
% of patients with ≥0.7% decrease from baseline	11%	36%	20%	68%

[a] P <0.0001 compared with sulfonylurea alone.

One of the 24- to 26-week trials included patients who were inadequately controlled on maximal doses of glyburide and switched to 4 mg of AVANDIA daily as monotherapy; in this group, loss of glycemic control was demonstrated, as evidenced by increases in FPG and HbA1c.

In a 2-year, double-blind trial, elderly patients (aged 59 to 89 years) on half-maximal sulfonylurea (glipizide 10 mg twice daily) were randomized to the addition of AVANDIA (n = 115, 4 mg once daily to 8 mg as needed) or to continued up-titration of glipizide (n = 110), to a maximum of 20 mg twice daily. Mean baseline FPG and HbA1c were 157 mg/dL and 7.72%, respectively, for the arm receiving AVANDIA plus glipizide and 159 mg/dL and 7.65%, respectively, for the glipizide up-titration arm. Loss of glycemic control (FPG ≥180 mg/dL) occurred in a significantly lower proportion of patients (2%) on AVANDIA plus glipizide compared with patients in the glipizide up-titration arm (28.7%). About 78% of the patients on combination therapy completed the 2 years of therapy while only 51% completed on glipizide monotherapy. The effect of combination therapy on FPG and HbA1c was durable over the 2-year trial period, with patients achieving a mean of 132 mg/dL for FPG and a mean of 6.98% for HbA1c compared with no change on the glipizide arm.

14.3 Combination with Sulfonylurea plus Metformin

In two 24- to 26-week, double-blind, placebo-controlled trials designed to assess the efficacy and safety of AVANDIA in combination with sulfonylurea plus metformin, AVANDIA 4 mg or 8 mg daily, was administered in divided doses twice daily, to patients inadequately controlled on submaximal (10 mg) and maximal (20 mg) doses of glyburide and maximal dose of metformin (2 g/day). A statistically significant improvement in FPG and HbA1c was observed in patients treated with the combinations of sulfonylurea plus metformin and 4 mg of AVANDIA and 8 mg of AVANDIA versus patients continued on sulfonylurea plus metformin, as shown in Table 12.

Table 12. Glycemic Parameters in a 26-Week Combination Trial of AVANDIA plus Sulfonylurea and Metformin

Parameter	Sulfonylurea + Metformin n = 273	AVANDIA 2 mg Twice Daily + Sulfonylurea + Metformin n = 276	AVANDIA 4 mg Twice Daily + Sulfonylurea + Metformin n = 277
FPG (mg/dL)			
Baseline (mean)	189	190	192
Change from baseline (mean)	14	-19	-40
Difference from sulfonylurea plus metformin (adjusted mean)	–	-30[a]	-52[a]
% of patients with ≥30 mg/dL decrease from baseline	16%	46%	62%
HbA1c (%)			
Baseline (mean)	8.7	8.6	8.7
Change from baseline (mean)	0.2	-0.4	-0.9
Difference from sulfonylurea plus metformin (adjusted mean)	–	-0.6[a]	-1.1[a]
% of patients with ≥0.7% decrease from baseline	16%	39%	63%

[a] P <0.0001 compared with placebo.

15 REFERENCES

1. Park JY, Kim KA, Kang MH, et al. Effect of rifampin on the pharmacokinetics of rosiglitazone in healthy subjects. *Clin Pharmacol Ther.* 2004;75:157-162.

16 HOW SUPPLIED/STORAGE AND HANDLING

Each pentagonal film-coated TILTAB tablet contains rosiglitazone as the maleate as follows:

2 mg: pink, debossed with GSK on one side and 2 on the other; bottles of 60: NDC 0173-0861-18

4 mg: orange, debossed with GSK on one side and 4 on the other; bottles of 30: NDC 0173-0863-13.

Store at 25°C (77°F); excursions 15° to 30°C (59° to 86°F). Dispense in a tight, light-resistant container.

17 PATIENT COUNSELING INFORMATION

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

There are multiple medications available to treat type 2 diabetes. The benefits and risks of each available diabetes medication should be taken into account when choosing a particular diabetes medication for a given patient.

Patients should be informed of the following:

- AVANDIA is not recommended for patients with symptomatic heart failure.
- A meta-analysis of mostly short-term trials suggested an increased risk for myocardial infarction with AVANDIA compared with placebo. Data from long-term clinical trials of AVANDIA versus other antidiabetes agents (metformin or sulfonylureas), including a cardiovascular outcome trial (RECORD), observed no difference in overall mortality or in major adverse cardiovascular events (MACE) and its components.
- AVANDIA is not recommended for patients who are taking insulin.
- Management of type 2 diabetes should include diet control. Caloric restriction, weight loss, and exercise are essential for the proper treatment of the diabetic patient because they help improve insulin sensitivity. This is important not only in the primary treatment of type 2 diabetes, but in maintaining the efficacy of drug therapy.
- It is important to adhere to dietary instructions and to regularly have blood glucose and glycosylated hemoglobin tested. It can take 2 weeks to see a reduction in blood glucose and 2 to 3 months to see the full effect of AVANDIA.
- Blood will be drawn to check their liver function prior to the start of therapy and periodically thereafter per the clinical judgment of the healthcare professional. Patients with unexplained symptoms of nausea, vomiting, abdominal pain, fatigue, anorexia, or dark urine should immediately report these symptoms to their physician.
- 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 AVANDIA should immediately report these symptoms to their physician.
- AVANDIA can be taken with or without meals.
- When using AVANDIA in combination with other hypoglycemic agents, the risk of hypoglycemia, its symptoms and treatment, and conditions that predispose to its development should be explained to patients and their family members.
- Inform female patients that treatment with AVANDIA, like other thiazolidinediones, may result in an unintended pregnancy in some premenopausal anovulatory women due to its effect on ovulation *[see Use in Specific Populations (8.3)]*.

GlaxoSmithKline

Research Triangle Park, NC 27709

AVD:34PI

MEDICATION GUIDE

AVANDIA (ah-VAN-dee-a)

(rosiglitazone maleate tablets), for oral use

What is the most important information I should know about AVANDIA?

AVANDIA may cause serious side effects, including:

New or worse heart failure

- The risk of heart failure may be higher in people who take AVANDIA with insulin. Most people who take insulin should not also take AVANDIA.
- AVANDIA can cause your body to keep extra fluid (fluid retention), which leads to swelling (edema) and weight gain. Extra body fluid can make some heart problems worse or lead to heart failure. Heart failure means your heart does not pump blood well enough.
- If you have severe heart failure, you cannot start AVANDIA.
- If you have heart failure with symptoms (such as shortness of breath or swelling), even if these symptoms are not severe, AVANDIA may not be right for you.

Call your doctor right away if you have any of the following:

- swelling or fluid retention, especially in the ankles or legs
- shortness of breath or trouble breathing, especially when you lie down
- an unusually fast increase in weight
- unusual tiredness

AVANDIA can have other serious side effects. Be sure to read the section below "What are possible side effects of AVANDIA?"

What is AVANDIA?

AVANDIA is a prescription medicine used with diet and exercise to treat adults with type 2 ("adult-onset" or "non-insulin dependent") diabetes mellitus ("high blood sugar").

AVANDIA helps to control high blood sugar. AVANDIA may be used alone or with other diabetes medicines. AVANDIA can help your body respond better to insulin made in your body. AVANDIA does not cause your body to make more insulin.

AVANDIA is not for people with type 1 diabetes mellitus or to treat a condition called diabetic ketoacidosis.

It is not known if AVANDIA is safe and effective in children younger than 18 years old.

Who should not take AVANDIA?

Many people with heart failure should not start taking AVANDIA. See "What should I tell my doctor before taking AVANDIA?"

Do not take AVANDIA if

- you are allergic to rosiglitazone or any of the ingredients in AVANDIA. See the end of this Medication Guide for a complete list of ingredients in AVANDIA.

  Symptoms of a severe allergic reaction with AVANDIA may include:

  - swelling of your face, lips, tongue, or throat
  - problems with breathing or swallowing
  - blisters on your skin or in your mouth, nose, or eyes
  - peeling of your skin

○ skin rash or itching	○ fainting or feeling dizzy
○ raised red areas on your skin (hives)	○ very rapid heartbeat

What should I tell my healthcare provider before taking AVANDIA?

Before starting AVANDIA, ask your healthcare provider about what the choices are for diabetes medicines, and what the expected benefits and possible risks are for you in particular.

Before you take AVANDIA, tell your healthcare provider about all of your medical conditions, including if you:

- **have heart problems or heart failure.**
- **have type 1 ("juvenile") diabetes or had diabetic ketoacidosis.** These conditions should be treated with insulin.
- **have liver problems.** Your healthcare provider should do blood tests to check your liver before you start taking AVANDIA and during treatment as needed.
- **have a type of diabetic eye disease called macular edema** (swelling of the back of the eye).
- **are pregnant or plan to become pregnant.** It is not known if AVANDIA can harm your unborn baby. You and your healthcare provider should talk about the best way to control your diabetes during pregnancy. If you are a premenopausal woman (before the "change of life") who does not have regular monthly periods, AVANDIA may increase your chances of becoming pregnant. Talk to your healthcare provider about birth control choices while taking AVANDIA. Tell your healthcare provider right away if you become pregnant while taking AVANDIA.
- **are breastfeeding or planning to breastfeed.** It is not known if AVANDIA passes into breast milk. You and your healthcare provider should decide if you will take AVANDIA or breastfeed. You should not do both.

Tell your healthcare provider about all of the medicines you take including prescription and over-the-counter medicines, vitamins, or herbal supplements. AVANDIA and certain other medicines can affect each other and may lead to serious side effects including high or low blood sugar, or heart problems. Especially tell your healthcare provider if you take:

- **insulin.**
- **any medicines for high blood pressure, high cholesterol, or heart failure, or for prevention of heart disease or stroke.**

Know the medicines you take. Keep a list of your medicines and show it to your healthcare provider and pharmacist before you start a new medicine. They will tell you if it is alright to take AVANDIA with other medicines.

How should I take AVANDIA?

- Take AVANDIA exactly as prescribed. Your healthcare provider will tell you how many tablets to take and how often. The usual daily starting dose is 4 mg a day taken one time each day or 2 mg taken two times each day. Your healthcare provider may need to adjust your dose until your blood sugar is better controlled.
- AVANDIA may be prescribed alone or with other diabetes medicines. This will depend on how well your blood sugar is controlled.
- Take AVANDIA with or without food.
- It can take 2 weeks for AVANDIA to start lowering blood sugar. It may take 2 to 3 months to see the full

effect on your blood sugar level.

- If you miss a dose of AVANDIA, take it as soon as you remember, unless it is time to take your next dose. Take your next dose at the usual time. Do not take double doses to make up for a missed dose.
- If you take too much AVANDIA, call your healthcare provider or poison control center right away.
- Test your blood sugar regularly as your healthcare provider tells you.
- Diet and exercise can help your body use its blood sugar better. It is important to stay on your recommended diet, lose extra weight, and get regular exercise while taking AVANDIA.
- Your healthcare provider should do blood tests to check your liver before you start AVANDIA and during treatment as needed. Your healthcare provider should also do regular blood sugar tests (for example, "A1C") to monitor your response to AVANDIA.

What are possible side effects of AVANDIA?

AVANDIA may cause serious side effects including:

- **New or worse heart failure.** See "What is the most important information I should know about AVANDIA?"
- **Heart attack.** AVANDIA may increase the risk of a heart attack. Talk to your healthcare provider about what this means to you.

  Symptoms of a heart attack can include the following:
  - chest discomfort in the center of your chest that lasts for more than a few minutes, or that goes away or comes back
  - chest discomfort that feels like uncomfortable pressure, squeezing, fullness, or pain
  - pain or discomfort in your arms, back, neck, jaw, or stomach
  - shortness of breath with or without chest discomfort
  - breaking out in a cold sweat
  - nausea or vomiting
  - feeling lightheaded

  Call your healthcare provider or go to the nearest hospital emergency room right away if you think you are having a heart attack.
- **Swelling (edema).** AVANDIA can cause swelling due to fluid retention. See "What is the most important information I should know about AVANDIA?"
- **Weight gain.** AVANDIA can cause weight gain that may be due to fluid retention or extra body fat. Weight gain can be a serious problem for people with certain conditions including heart problems. See "What is the most important information I should know about AVANDIA?"
- **Liver problems.** It is important for your liver to be working normally when you take AVANDIA. Your healthcare provider should do blood tests to check your liver before you start taking AVANDIA and during treatment as needed. Call your healthcare provider right away if you have unexplained symptoms such as:
  - nausea or vomiting
  - stomach pain
  - unusual or unexplained tiredness
  - loss of appetite

- dark urine
- yellowing of your skin or the whites of your eyes.

- **Macular edema** (a diabetic eye disease with swelling in the back of the eye). Tell your healthcare provider right away if you have any changes in your vision. Your healthcare provider should check your eyes regularly. Very rarely, some people have had vision changes due to swelling in the back of the eye while taking AVANDIA.
- **Fractures (broken bones),** usually in the hand, upper arm, or foot. Talk to your healthcare provider for advice on how to keep your bones healthy.
- **Low red blood cell count (anemia).**
- **Low blood sugar (hypoglycemia).** Lightheadedness, dizziness, shakiness, or hunger may mean that your blood sugar is too low. This can happen if you skip meals, if you use another medicine that lowers blood sugar, or if you have certain medical problems. Call your healthcare provider if low blood sugar levels are a problem for you.

The most common side effects of AVANDIA reported in clinical trials included cold-like symptoms and headache.

Tell your healthcare provider if you have any side effect that bothers you or that does not go away.

These are not all the possible side effects of AVANDIA. Call your healthcare provider for medical advice about side effects. You may report side effects to FDA at 1-800-FDA-1088.

How should I store AVANDIA?

- Store AVANDIA at room temperature, 59°F to 86°F (15°C to 30°C). Keep AVANDIA in the container it comes in.
- Safely, throw away AVANDIA that is out of date or no longer needed.
- Keep AVANDIA and all medicines out of the reach of children.

General information about AVANDIA

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

If you would like more information, talk with your healthcare provider. You can ask your healthcare provider or pharmacist for information about AVANDIA that is written for health professionals.

What are the ingredients in AVANDIA?

Active Ingredient: rosiglitazone maleate.

Inactive Ingredients: hypromellose 2910, lactose monohydrate, magnesium stearate, microcrystalline cellulose, polyethylene glycol 3000, sodium starch glycolate, titanium dioxide, triacetin, and 1 or more of the following: synthetic red and yellow iron oxides and talc.

Always check to make sure that the medicine you are taking is the correct one. AVANDIA tablets are triangles with rounded corners and look like this:

2 mg – pink with “GSK” on one side and “2” on the other.

4 mg – orange with “GSK” on one side and “4” on the other.

GlaxoSmithKline
Research Triangle Park, NC 27709
For more information call 1-888-825-5249.

AVD: 10MG

This Medication Guide has been approved by the U.S. Food and Drug Administration. Revised: 02/2019