AUBAGIO® (teriflunomide) tablets, for oral use

Initial U.S. Approval: 2012

WARNING: HEPATOTOXICITY and EMBRYOFETAL TOXICITY

See full prescribing information for complete boxed warning.

- Hepatotoxicity
  Clinically significant and potentially life-threatening liver injury, including acute liver failure requiring transplant, has been reported in patients treated with AUBAGIO in the postmarketing setting (5.1). Concomitant use of AUBAGIO with other hepatotoxic drugs may increase the risk of severe liver injury. Obtain transaminase and bilirubin levels within 6 months before initiation of AUBAGIO and monitor ALT levels at least monthly for six months (5.1). If drug induced liver injury is suspected, discontinue AUBAGIO and start accelerated elimination procedure (5.3).

- Embryofetal Toxicity
  Teratogenicity and embryolethality occurred in animals administered teriflunomide (5.2, 8.1). Exclude pregnancy prior to initiating AUBAGIO therapy (4, 5.2, 8.1, 8.3). If patient develops symptoms consistent with peripheral neuropathy, evaluate patient and consider discontinuing AUBAGIO. (5.8)

Dosage and Administration

7 mg or 14 mg orally once daily, with or without food. (2)

Dosage Forms and Strengths

7 mg and 14 mg film-coated tablets (3)

Contraindications

- Severe hepatic impairment (4, 5.1)
- Pregnancy (4, 5.2, 8.1)
- Hypersensitivity (4, 5.5)
- Current leflunomide treatment (4)

Warnings and Precautions

- Elimination of AUBAGIO can be accelerated by administration of cholestyramine or activated charcoal for 11 days. (5.3)
- AUBAGIO may decrease WBC. A recent CBC should be available before starting AUBAGIO. Monitor for signs and symptoms of infection. Consider suspending treatment with AUBAGIO in case of serious infection. Do not start AUBAGIO in patients with active infections. (5.4)
- Stop AUBAGIO if patient has anaphylaxis, angioedema, Stevens-Johnson syndrome, toxic epidermal necrolysis, drug reaction with eosinophilia and systemic symptoms; initiate rapid elimination. (5.3, 5.5, 5.6, 5.7)
- If patient develops symptoms consistent with peripheral neuropathy, evaluate patient and consider discontinuing AUBAGIO. (5.8)
- AUBAGIO may increase blood pressure. Measure blood pressure at treatment initiation and monitor blood pressure during treatment. (5.9)

Adverse Reactions

Most common adverse reactions (≥10% and ≥2% greater than placebo): headache, diarrhea, nausea, alopecia, increase in ALT. (6)

To report SUSPECTED ADVERSE REACTIONS, contact Genzyme Corporation at 1-800-745-4447 or FDA at 1-800-FDA-1088 or www.fda.gov/medwatch.

Drug Interactions

- Drugs metabolized by CYP2C8 and OAT3 transporters: Monitor patients because teriflunomide may increase exposure of these drugs. (7)
- Teriflunomide may increase exposure of ethinylestradiol and levonorgestrel. Choose an appropriate oral contraceptive. (7)
- Drugs metabolized by CYP1A2: Monitor patients because teriflunomide may decrease exposure of these drugs. (7)
- Teriflunomide may increase exposure of these drugs. (7)
- Drugs metabolized by BCRP and OATP1B1/B3 transporters: Monitor patients because teriflunomide may increase exposure of these drugs. (7)
- Rosuvastatin: The dose of rosuvastatin should not exceed 10 mg once daily in patients taking AUBAGIO. (7)

See 17 for PATIENT COUNSELING INFORMATION and Medication Guide

Revised: 11/2020
**1 INDICATIONS AND USAGE**

AUBAGIO® is indicated for the treatment of relapsing forms of multiple sclerosis (MS), to include clinically isolated syndrome, relapsing-remitting disease, and active secondary progressive disease, in adults.

**2 DOSAGE AND ADMINISTRATION**

The recommended dose of AUBAGIO is 7 mg or 14 mg orally once daily. AUBAGIO can be taken with or without food.

**Monitoring for Assess Safety**

- Obtain transaminase and bilirubin levels within 6 months before initiation of AUBAGIO therapy.
- Monitor ALT at least monthly for six months after starting AUBAGIO therapy.

**3 DOSAGE FORMS AND STRENGTHS**

- AUBAGIO is available as 7 mg and 14 mg tablets.

**4 CONTRAINDICATIONS**

- Patients with severe hepatic impairment should not use AUBAGIO.
- Pregnant women or females of reproductive potential to use effective contraception during AUBAGIO treatment and during an accelerated drug elimination procedure after AUBAGIO treatment.
- Pregnancy in females of reproductive potential to use effective contraception during AUBAGIO treatment and during an accelerated drug elimination procedure after AUBAGIO treatment.

**5 WARNINGS AND PRECAUTIONS**

**5.1 Hepatotoxicity**

Clinically significant and potentially life-threatening liver injury, including acute liver failure requiring transplant, has been reported in patients treated with AUBAGIO in the postmarketing setting [see Warnings and Precautions (5.1)]. Concomitant use of AUBAGIO with other hepatotoxic drugs may increase the risk of severe liver injury. Obtain transaminase and bilirubin levels within 6 months before initiation of AUBAGIO therapy. Monitor ALT levels at least monthly for six months after starting AUBAGIO therapy [see Warnings and Precautions (5.1)]. If drug induced liver injury is suspected, discontinue AUBAGIO and start an accelerated elimination procedure with cholestyramine or charcoal [see Warnings and Precautions (5.3)]. AUBAGIO is contraindicated in patients with severe hepatic impairment [see Contraindications (4)]. Patients with pre-existing liver disease may be at increased risk of developing elevated serum transaminases when taking AUBAGIO.

**5.2 Embryofetal Toxicity**

AUBAGIO is contraindicated for use in pregnant women and in females of reproductive potential who are not using effective contraception because of the potential for fetal harm. Teratogenicity and embryolethality occurred in animals at plasma teriflunomide exposures lower than that in humans. Exclude pregnancy before the start of treatment with AUBAGIO in females of reproductive potential. Advise females of reproductive potential to use effective contraception during AUBAGIO treatment and during an accelerated drug elimination procedure after AUBAGIO treatment. Stop AUBAGIO and use an accelerated drug elimination procedure if the patient becomes pregnant [see Contraindications (4), Warnings and Precautions (5.2, 5.3), Use in Specific Populations (8.1, 8.3), and Clinical Pharmacology (12.3)].
In clinical studies with AUBAGIO, cases of tuberculosis have been observed. Prior to initiating AUBAGIO, screen patients for latent tuberculosis infection with a tuberculin skin test or with a blood test for mycobacterium tuberculosis infection. AUBAGIO has not been studied in patients with a positive tuberculin skin test, and the safety of AUBAGIO in adults with latent tuberculosis infection is unknown. For patients testing positive in tuberculosis screening, treat by standard medical practice prior to therapy with AUBAGIO.

Vaccination

No clinical data are available on the efficacy and safety of live vaccinations in patients taking AUBAGIO. Vaccination with live vaccines is not recommended. The long half-life of AUBAGIO should be considered when contemplating administration of a live vaccine after stopping AUBAGIO.

Malignancy

The risk of malignancy, particularly lymphoproliferative disorders, is increased with the use of some immunosuppressive medications. There is a potential for immunosuppression with AUBAGIO. No apparent increased risk of malignancy or lymphoproliferative disorders were re-exposed in the AUBAGIO clinical trials, but larger and longer-term studies would be needed to determine whether there is an increased risk of malignancy or lymphoproliferative disorders with AUBAGIO.

5.5 Hypersensitivity Reactions

AUBAGIO can cause anaphylaxis and severe allergic reactions [see Contraindications (4)]. Signs and symptoms have included dyspnea, urticaria, and angioedema including lips, eyes, throat, and tongue. Inform patients of the signs and symptoms of anaphylaxis and angioedema.

5.6 Serious Skin Reactions

Cases of serious skin reactions, sometimes fatal, including Stevens-Johnson syndrome (SJS), toxic epidermal necrolysis (TEN), and drug reaction with eosinophilia and systemic symptoms (DRESS) [see Warnings and Precautions (5.7)] have been reported with AUBAGIO. Fatal outcomes were reported in one case of TEN and one case of DRESS. Inform patients of the signs and symptoms that may signal a serious skin reaction. Instruct patients to discontinue AUBAGIO and seek immediate medical care should these signs and symptoms occur.

5.7 Drug Reaction with Eosinophilia and Systemic Symptoms

Drug reaction with eosinophilia and systemic symptoms (DRESS), also known as multorgan hypersensitivity, has occurred with AUBAGIO. One fatal case of DRESS that occurred in close temporal association (34 days) with the initiation of AUBAGIO treatment has been reported in the postmarketing setting. DRESS typically, although not exclusively, presents with fever, rash, lymphadenopathy and/or facial swelling, in association with other organ system involvement, such as hepatitis, nephritis, hematologic abnormalities, myocarditis, or myositis, sometimes resembling an acute viral infection. Eosinophilia is often present. This disorder is variable in its expression, and other organ systems not noted here may be involved. It is important to note that early manifestations of hypersensitivity (e.g., fever, lymphadenopathy) may be present even though rash is not evident. If such signs or symptoms are present, the patient should be evaluated immediately. Discontinue AUBAGIO, unless an alternative etiology for the signs or symptoms is established, and begin an accelerated elimination procedure immediately [see Warnings and Precautions (5.3)]. In such cases, patients should not be re-exposed to terflunomide [see Contraindications (4)].

5.8 Peripheral Neuropathy

In placebo-controlled studies, peripheral neuropathy, including both polyneuropathy and mononeuropathy (e.g., carpal tunnel syndrome), occurred more frequently in patients taking AUBAGIO than in patients taking placebo. The incidence of peripheral neuropathy confirmed by nerve conduction studies was 1.4% (13 patients) and 1.9% (17 patients) of patients receiving 7 mg and 14 mg of AUBAGIO, respectively, compared with 0.4% receiving placebo (4 patients). Treatment was discontinued in 0.7% (8 patients) with confirmed peripheral neuropathy (3 patients receiving AUBAGIO 7 mg and 5 patients receiving AUBAGIO 14 mg). Five of them recovered following treatment discontinuation. Not all cases of peripheral neuropathy resolved with continued treatment. Peripheral neuropathy also occurred in patients receiving leflunomide. Age older than 60 years, concomitant neurotoxic medications, and diabetes may increase the risk for peripheral neuropathy. If a patient taking AUBAGIO develops symptoms consistent with peripheral neuropathy or tingling of hands or feet, consider continued AUBAGIO therapy and performing an accelerated elimination procedure [see Warnings and Precautions (5.3)].

5.9 Increased Blood Pressure

In placebo-controlled studies, the mean change from baseline to the end of study in systolic blood pressure was +2.3 mmHg and +2.7 mmHg for AUBAGIO 7 mg and 14 mg, respectively, and +0.6 mmHg for placebo. The change from baseline in diastolic blood pressure was +1.4 mmHg and +1.9 mmHg for AUBAGIO 7 mg and 14 mg, respectively, and +0.3 mmHg for placebo. Hypertension was an adverse reaction in 3.1% and 4.3% of patients treated with 7 mg or 14 mg of AUBAGIO compared with 1.8% for placebo. Check blood pressure before start of AUBAGIO treatment and periodically thereafter. Elevated blood pressure should be appropriately managed during treatment with AUBAGIO.

5.10 Respiratory Effects

Interstitial lung disease, including acute interstitial pneumonitis, has been reported with AUBAGIO in the postmarketing setting. Interstitial lung disease and worsening of pre-existing interstitial lung disease have been reported during treatment with leflunomide. Interstitial lung disease may be fatal and may occur acutely at any time during therapy with a variable clinical presentation. New onset or worsening pulmonary symptoms, such as cough and dyspnea, with or without associated fever, may be a reason for discontinuation of therapy and for further investigation as appropriate. If discontinuation of the drug is necessary, consider initiation of an accelerated elimination procedure [see Warnings and Precautions (5.3)].

5.11 Concomitant Use with Immunosuppressive or Immunomodulating Therapies

Coadministration of an anti- or immunosuppressive therapies used for treatment of multiple sclerosis has not been evaluated. Safety studies in which AUBAGIO was concomitantly administered with other immune modulating therapies for up to one year (interferon beta, glatiramer acetate) did not reveal any specific safety concerns. The long term safety of these combinations in the treatment of multiple sclerosis has not been established. In any situation in which the decision is made to switch from AUBAGIO to another agent with a known potential for hematologic suppression, it would be prudent to monitor for hematologic toxicity; because there will be overlap of systemic exposure to both compounds. Use of an accelerated elimination procedure may not be appropriate due to variability in drug exposure and clearance relative to the time of AUBAGIO discontinuation.

ADVERSE REACTIONS

The following serious adverse reactions are described elsewhere in the prescribing information:

- **Hepatotoxicity** [see Contraindications (4) and Warnings and Precautions (5.1)]
- **Bone Marrow Effects/Immunosuppression Potential/Infections** [see Warnings and Precautions (5.4)]
- **Hypersensitivity Reactions** [see Contraindications (4) and Warnings and Precautions (5.5)]
- **Serious Skin Reactions** [see Warnings and Precautions (5.6)]
- **Drug Reaction with Eosinophilia and Systemic Symptoms** [see Warnings and Precautions (5.7)]
- **Peripheral Neuropathy** [see Warnings and Precautions (5.8)]
- **Increased Blood Pressure** [see Warnings and Precautions (5.9)]
- **Respiratory Effects** [see Warnings and Precautions (5.10)]

### Table 1: Adverse Reactions in Pooled Placebo-Controlled Studies in Patients with Relapsing Forms of Multiple Sclerosis

<table>
<thead>
<tr>
<th>Adverse Reaction</th>
<th>AUBAGIO 7 mg (N=1045)</th>
<th>AUBAGIO 14 mg (N=1002)</th>
<th>Placebo (N=997)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Headache</td>
<td>18%</td>
<td>16%</td>
<td>15%</td>
</tr>
<tr>
<td>Increase in Alanine aminotransferase</td>
<td>13%</td>
<td>15%</td>
<td>9%</td>
</tr>
<tr>
<td>Diarrhea</td>
<td>13%</td>
<td>14%</td>
<td>8%</td>
</tr>
<tr>
<td>Alopecia</td>
<td>10%</td>
<td>13%</td>
<td>5%</td>
</tr>
<tr>
<td>Nausea</td>
<td>8%</td>
<td>11%</td>
<td>7%</td>
</tr>
<tr>
<td>Paresthesia</td>
<td>8%</td>
<td>9%</td>
<td>7%</td>
</tr>
<tr>
<td>Arthralgia</td>
<td>8%</td>
<td>6%</td>
<td>4%</td>
</tr>
<tr>
<td>Neutropenia</td>
<td>4%</td>
<td>6%</td>
<td>2%</td>
</tr>
<tr>
<td>Hypertension</td>
<td>3%</td>
<td>4%</td>
<td>2%</td>
</tr>
</tbody>
</table>

Cardiovascular Deaths

Four cardiovascular deaths, including three sudden deaths, and one myocardial infarction in a patient with a history of hypertension and hyperlipidemia were reported among approximately 2600 patients exposed to AUBAGIO in the premarketing database. These cardiovascular deaths occurred during uncontrolled extension studies, one to nine years after initiation of treatment. A relationship between AUBAGIO and cardiovascular death has not been established.

Acute Renal Failure

In placebo-controlled studies, creatinine values increased more than 100% over baseline in 8/1045 (0.8%) patients in the 7 mg AUBAGIO group and 6/1002 (0.6%) patients in the 14 mg AUBAGIO group versus 4/997 (0.4%) patients in the placebo group. These elevations were transient. Some elevations were accompanied by hyperkalemia. AUBAGIO may cause acute uric acid nephropathy with transient acute renal failure because AUBAGIO increases renal uric acid clearance.

### 6 DRUG INTERACTIONS

**Effect of AUBAGIO on CYP2C8 Substrates**

Teriflunomide is an inhibitor of CYP2C8 in vivo. In patients taking AUBAGIO, exposure of drugs metabolized by CYP2C8 (e.g., pancuronium, clopidogrel, naproxen, tiotropium) may be increased. Monitor these patients and adjust the dose of the concomitant drug(s) metabolized by CYP2C8 as required [see Clinical Pharmacology (12.3)].

**Effect of AUBAGIO on Warfarin**

Co-administration of AUBAGIO with warfarin requires close monitoring of the international normalized ratio (INR) because AUBAGIO may increase INR by approximately 25%. Effect of AUBAGIO on Oral Contraceptives

AUBAGIO may increase the systemic exposures of ethinylestradiol and levonorgestrel. Consideration should be given to the type or dose of contraceptives used in combination with AUBAGIO [see Clinical Pharmacology (12.3)].
Effect of AUBAGIO on Organic Anion Transporter 3 (OAT3) Substrates

Teriflunomide inhibits the activity of OAT3 in vivo. In patients taking AUBAGIO, exposure of drugs which are OAT3 substrates (e.g., cefadroxil, cimetidine, ciprofloxacin, pencillin G, ketoprofen, fusulosamide, methotrexate, zidovudine) may be increased. Monitor these patients and adjust the dose of the concomitant drug(s) which are OAT3 substrates as required [see Clinical Pharmacology (12.3)].

Effect of AUBAGIO on BCRP and Organic Anion Transporter 3 (OAT3) Substrates

Teriflunomide inhibits the activity of OAT3 in vivo. In patients taking AUBAGIO, exposure of drugs which are OAT3 substrates (e.g., cefadroxil, cimetidine, ciprofloxacin, pencillin G, ketoprofen, fusulosamide, methotrexate, zidovudine) may be increased. Monitor these patients and adjust the dose of the concomitant drug(s) which are OAT3 substrates as required [see Clinical Pharmacology (12.3)].

Effect of AUBAGIO on BCRP and Organic Anion Transporting Polypeptide B1 and B3 (OATP1B1/3B1 Substrates

Teriflunomide inhibits the activity of BCRP and OATP1B1/3B1 in vivo. For a patient taking AUBAGIO, the dose of rosuvastatin should not exceed 10 mg once daily. For other substrates of BCRP (e.g., mitoxantrone) and drugs in the OATP family (e.g., methotrexate, rifampin), especially HMG-Co reductase inhibitors (e.g., atorvastatin, nateglinide, pravastatin, repaglinide, and simvastatin), consider reducing the dose of these drugs and monitor patients closely for signs and symptoms of increased exposures to the drugs while patients are taking AUBAGIO [see Clinical Pharmacology (12.3)].

8 USE IN SPECIFIC POPULATIONS

8.1 Pregnancy

Pregnancy Registry

There is a pregnancy registry that monitors pregnancy outcomes in women exposed to AUBAGIO during pregnancy. Healthcare providers and patients are encouraged to report pregnancies by calling 1-800-745-4447, option 2.

Risk Summary

AUBAGIO is contraindicated for use in pregnant women and females of reproductive potential not using effective contraception. Women should be advised that AUBAGIO is contraindicated in patients with severe hepatic impairment. AUBAGIO should be discontinued if pregnancy becomes apparent while the drug is being administered. To minimize any possible risk, men not wishing to father a child and their female partners should use effective contraception. Men wishing to father a child should discontinue use of AUBAGIO and undergo an accelerated elimination procedure or wait until verification that the plasma teriflunomide concentration is less than 0.02 mg/L (0.02 mcg/mL) [see Warnings and Precautions (5.3)].

Fetal/Neonatal adverse reactions

Lowering the plasma concentration of teriflunomide by instituting an accelerated drug elimination procedure as soon as pregnancy is detected may decrease the risk to the fetus from AUBAGIO exposure.

The accelerated drug elimination procedure includes verification that the plasma teriflunomide concentration is less than 0.02 mg/L [see Warnings and Precautions (5.3) and Clinical Pharmacology (12.3)].

Data

Human data

Available human data are limited. Prospective reported data (from clinical trials and postmarketing reports) from >150 pregnancies in patients treated with teriflunomide and >300 pregnancies in patients treated with leflunomide have not demonstrated an increased risk of congenital malformations or miscarriage following teriflunomide exposure in the early first trimester when followed by an accelerated elimination procedure [see Clinical Considerations and Data]. There are no human data pertaining to exposures later in the first trimester or beyond.

In the US general population, the estimated background risk of major birth defects and miscarriage in clinically recognized pregnancies is 2%–4% and 15%–20%, respectively. The background risk of major birth defects is not known to be controllable in the indicated population.

Clinical Considerations

Fetal/Neonatal adverse reactions

Lowering the plasma concentration of teriflunomide by instituting an accelerated drug elimination procedure as soon as pregnancy is detected may decrease the risk to the fetus from AUBAGIO exposure.

The accelerated drug elimination procedure includes verification that the plasma teriflunomide concentration is less than 0.02 mg/L [see Warnings and Precautions (5.3) and Clinical Pharmacology (12.3)].

Animal data

When teriflunomide (oral doses of 1, 3, or 10 mg/kg/day) was administered to pregnant rats throughout the period of organogenesis, high incidences of fetal malformation (primarily craniofacial, and axial and appendicular skeletal defects) and fetal death were observed at doses not associated with maternal toxicity. Adverse effects on fetal development were observed following dosing at various stages throughout organogenesis. Maternal plasma exposure at the no-effect level (1.0 mg/kg/day) for fetal developmental toxicity in rats was less than that in humans at the maximum recommended human dose of teriflunomide (14 mg/day).

Administration of teriflunomide (oral doses of 1, 3, 5, or 12 mg/kg/day) to pregnant rabbits throughout organogenesis resulted in high incidences of fetal malformation (primarily craniofacial, and axial and appendicular skeletal defects) and fetal death at doses associated with minimal maternal toxicity. Maternal plasma exposure at the no-effect dose (1.0 mg/kg/day) for fetal developmental toxicity in rabbits was less than that in humans at the MRHD.

In studies in which teriflunomide (oral doses of 0.05, 0.1, 0.3, 0.6, or 1.0 mg/kg/day) was administered to rats during gestation and lactation, decreased growth, eye and skin abnormalities, and high incidences of malformation (craniofacial defects) and postnatal death were observed in the offspring at doses not associated with maternal toxicity. Maternal plasma exposure at the no-effect dose for prenatal and postnatal developmental toxicity in rats (0.1 mg/kg/day) was less than that in humans at the MRHD.

In animal reproduction studies of teriflunomide, embryolethality and teratogenic effects were observed in pregnant rat and rabbit at or below clinically relevant plasma teriflunomide exposures (AUC). In reproduction studies in pregnant mouse, leflunomide was embryotoxic and increased the incidence of malformations (craniofacial, axial skeletal, heart and great vessel). Supplementation with folic acid during pregnancy did not prevent teratogenic effects in pregnant mouse, suggesting that the mode of action (inhibition of de novo pyrimidine synthesis) is the same for therapeutic efficacy and developmental toxicity. At recommended doses in humans, teriflunomide and leflunomide result in a similar range of plasma concentrations of teriflunomide.

8.2 Lactation

Risk Summary

There are no data on the presence of AUBAGIO in human milk, the effects on the breastfed infant, or the effects on milk production. Teriflunomide was detected in rat milk following a single oral dose. Because of the potential for adverse reactions in a breastfed infant from AUBAGIO, women should not breastfeed during treatment with AUBAGIO.

Because of the potential for adverse reactions in a breastfed infant from AUBAGIO, women should not breastfeed during treatment with AUBAGIO.

There is no experience regarding teriflunomide overdose or intoxication in humans. Teriflunomide 70 mg daily up to 14 days was well tolerated by healthy subjects. In the event of clinically significant overdose or toxicity, cholestyramine or activated charcoal is recommended to accelerate elimination [see Warnings and Precautions (5.3)].

11 DESCRIPTION

AUBAGIO (teriflunomide) is an oral de novo pyrimidine synthesis inhibitor of the DHO-DH enzyme, with the chemical name (Z)-2-Cyano-3-hydroxy-but-2-enolic acid (4-terifluoromethylphenyl)-amide. Its molecular weight is 270.21, and the empirical formula is C_{15}H_{10}F_{3}N_{2}O_{2} with the following chemical structure:

Teriflunomide is a white to almost white powder that is sparingly soluble in acetone, slightly soluble in polyethylene glycol and ethanol, and very slightly soluble in isopropanol and practically insoluble in water. Teriflunomide is formulated as film-coated tablets for oral administration. AUBAGIO tablets contain 7 mg or 14 mg of teriflunomide and the following inactive ingredients: lactose monohydrate, corn starch, hydroxypropyl cellulose, microcrystalline cellulose, sodium starch glycolate, and magnesium stearate. The film coating for the 14 mg tablet is made of hypromellose, titanium dioxide, talc, polyethylene glycol and indigo carmine aluminum lake. In addition to these, the 7 mg tablet film coating includes iron oxide yellow.

12 CLINICAL PHARMACOLOGY

12.1 Mechanism of Action

Teriflunomide, an immunomodulatory agent with anti-inflammatory properties, inhibits dihydroorotate dehydrogenase, a mitochondrial enzyme involved in de novo pyrimidine synthesis. The exact mechanism by which teriflunomide exerts its therapeutic effect in multiple sclerosis is unknown but may involve a reduction in the number of activated lymphocytes in CNS.

12.2 Pharmacokinetics

12.2.1 Absorption

Immediately before Prolonging the QT Interval

In a placebo-controlled thorough QT study performed in healthy subjects, there was no evidence that teriflunomide caused QT interval prolongation of clinical significance (i.e., the upper bound of the 95% confidence interval for the largest placebo-adjusted, baseline-corrected QTc was below 10 ms).

12.3 Pharmacokinetics

Teriflunomide is the principal active metabolite of leflunomide and is responsible for leflunomide’s activity in vivo. At recommended doses, teriflunomide and leflunomide result in a similar range of plasma concentrations of teriflunomide.

Based on a population analysis of teriflunomide in healthy volunteers and MS patients, median t_{1/2} was approximately 18 and 19 days after repeated doses of 7 mg and 14 mg respectively. It takes approximately 3 months respectively to reach steady-state concentrations. The estimated AUC accumulation ratio is approximately 30 after repeated doses of 7 or 14 mg.

Absorption

Maximum time to reach maximum plasma concentrations is between 1 to 4 hours post dose following oral administration of teriflunomide.

Food does not have a clinically relevant effect on teriflunomide pharmacokinetics.

Distribution

Teriflunomide is extensively bound to plasma protein (>98%) and is mainly distributed in plasma. The volume of distribution is 11 L after a single intravenous (IV) administration.
Teriflunomide is not metabolized by Cytochrome P450 or flavin monooxygenase oxidase enzymes. The potential effect of AUBAGIO on other drugs

CYP2C9 substrates

There was an increase in mean rapaglipine Cmax and AUC (1.7- and 2.4-fold, respectively) following repeated doses of teriflunomide and a single dose of 0.25 mg repaglinide, suggesting that teriflunomide is an inhibitor of CYP2C9 in vivo. The magnitude of interaction could be higher at the recommended dose (see Drug Interactions [7]).

CYP1A2 substrates

Repeated doses of teriflunomide decreased mean Cmax and AUC of caffeine by 18% and 55%, respectively, suggesting that teriflunomide may be a weak inducer of CYP1A2 in vivo (see Drug Interactions [7]).

OAT3 substrates

There was an increase in mean cetoterol Cmax and AUC (1.43- and 1.54-fold, respectively), following repeated doses of teriflunomide, suggesting that teriflunomide is an inhibitor of organic anion transporter 3 (OAT3) in vivo (see Drug Interactions [7]).

BCRP and OATP1B1/1B3 substrates

There was an increase in mean rosuvastatin Cmax and AUC (2.65- and 2.51-fold, respectively) following repeated doses of teriflunomide, suggesting that teriflunomide is an inhibitor of BCRP transporter and organic anion transporting polypeptide 1B1 and 1B3 (OATP1B1/1B3) (see Drug Interactions [7]).

OAT1 substrates

There was an increase in mean eptifibatide Cmax and AUC (1.6- and 1.7-fold, respectively) and levonordefrin Cmax and AUC (1.2- and 1.4-fold, respectively) following repeated doses of teriflunomide (see Drug Interactions [7]).

Teriflunomide did not affect the pharmacokinetics of bupropion (a CYP2B6 substrate), midazolam (a CYP3A4 substrate), S-warfarin (a CYP2C9 substrate), omeprazole (a CYP2C19 substrate), and metoprolol (a CYP2D6 substrate).

The potential effect of other drugs on AUBAGIO

Potent CYP and transporter inducers: Rifampin did not affect the pharmacokinetics of teriflunomide (see Drug Interactions [7]).

Drug Interaction Studies

Interactions (7)

ADDITIONAL STUDY RESULTS

Study 1 was a double-blind, placebo-controlled clinical trial that evaluated once daily doses of AUBAGIO 7 mg and AUBAGIO 14 mg for up to 40 months in patients with relapsing forms of multiple sclerosis. Patients were required to have a diagnosis of multiple sclerosis exhibiting a relapsing clinical course, and to have experienced at least one relapse over the year preceding the trial or at least two relapses over the two years preceding the trial. Patients were required not to have received interferon-beta for at least four months, or any other multiple sclerosis medication for at least six months before entering the study, nor were these medications permitted during the study. Neurological evaluations were to be performed at screening, every 12 weeks until week 108, and after suspected relapses. MRI was to be performed at screening, and at week 24, 48, 72, and 108. The primary endpoint was the annualized relapse rate (ARR).

In Study 1, 1088 patients were randomized to receive AUBAGIO 7 mg (n=366), AUBAGIO 14 mg (n=359), or placebo (n=363). At entry, patients had an Expanded Disability Status Scale (EDSS) score ≤5.5. Patients had a mean age of 38 years, mean disease duration of 5 years, and mean EDSS at baseline of 2.7. A total of 91% of patients had relapsing remitting multiple sclerosis, and 9% had a progressive form of multiple sclerosis with relapses. The mean duration of treatment was 635, 627, and 631 days for AUBAGIO 7 mg, AUBAGIO 14 mg, and placebo, respectively. The percentage of patients who completed the study treatment period was 75%, 73%, and 71% for AUBAGIO 7 mg, AUBAGIO 14 mg, and placebo, respectively.

There was a statistically significant reduction in ARR for patients who received AUBAGIO 7 mg or AUBAGIO 14 mg, compared to patients who received placebo (see Table 2). There was a consistent reduction of the ARR in the noted subgroups defined by sex, age group, prior multiple sclerosis therapy, and baseline disease activity.

There was a statistically significant reduction in the relative risk of disability progression at week 108 sustained for 12 weeks (as measured by at least a 1-point increase from baseline EDSS ≤5.5 or a 0.5 point increase for those with a baseline EDSS >5.5) in the AUBAGIO 14 mg group compared to placebo (see Table 2 and Figure 1).

The effect of AUBAGIO on several magnetic resonance imaging (MRI) variables, including the total lesion volume of T2 and hypointense T1 lesions, was assessed in Study 1. The change in total lesion volume from baseline was significantly lower in the AUBAGIO 7 mg and AUBAGIO 14 mg groups than in the placebo group. Patients in both AUBAGIO groups had significantly fewer gadolinium-enhancing lesions per 11-weighted scan than those in the placebo group (see Table 2).

Table 2: Clinical and MRI Results of Study 1

<table>
<thead>
<tr>
<th></th>
<th>AUBAGIO 7 mg</th>
<th>AUBAGIO 14 mg</th>
<th>Placebo</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical Endpoints</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Annualized relapse rate</td>
<td>0.370 (p=0.0002)</td>
<td>0.369 (p=0.0005)</td>
<td>0.539</td>
</tr>
<tr>
<td>Relative risk reduction</td>
<td>31%</td>
<td>31%</td>
<td>–</td>
</tr>
<tr>
<td>Percent of patients remaining relapse-free at week 108</td>
<td>53.7%</td>
<td>56.5%</td>
<td>45.6%</td>
</tr>
<tr>
<td>Percent disability progression at week 108</td>
<td>21.7% (p=0.084)</td>
<td>20.2% (p=0.028)</td>
<td>27.3%</td>
</tr>
<tr>
<td>Hazard ratio</td>
<td>0.76</td>
<td>0.70</td>
<td>–</td>
</tr>
<tr>
<td>MRI Endpoints</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean number of Gd-enhancing T1 lesions per scan</td>
<td>0.570 (p=0.0001)</td>
<td>0.261 (p=0.0001)</td>
<td>1.331</td>
</tr>
</tbody>
</table>

†p-values based on cubic root transformed data for total lesion volume

Figure 1: Kaplan-Meier Plot of Time to Disability Progression Sustained for 12 Weeks (Study 1)

Study 2 was a double-blind, placebo-controlled clinical trial that evaluated once daily doses of AUBAGIO 7 mg and AUBAGIO 14 mg for up to 40 months in patients with relapsing forms of multiple sclerosis. Patients were required to have a diagnosis of multiple sclerosis exhibiting a relapsing clinical course and to have experienced at least one relapse over the year preceding the trial, or at least two relapses over the two years preceding the trial. Patients were required not to have received any multiple
AUBAGIO is available as 7 mg and 14 mg tablets.

Figure 2: Kaplan-Meier Plot of Time to Disability Progression Sustained for 12 Weeks (Study 2)

Study 3 was a double-blind, placebo-controlled clinical trial that evaluated once daily doses of AUBAGIO 7 mg and AUBAGIO 14 mg for up to 108 weeks in patients with relapsing multiple sclerosis. Patients were required to have had a first clinical event consistent with acute demyelination occurring within 90 days of randomization with 2 or more T2 lesions at least 3 mm in diameter that were characteristic of multiple sclerosis. A total of 814 patients received AUBAGIO 7 mg (n=268), AUBAGIO 14 mg (n=264), or placebo (n=282). Patients had a mean age of 34 years, a mean disease duration of 6 years, and a mean EDSS of 2.9.

The 14 mg tablet is pale blue to pastel blue, pentagonal film-coated tablet with dose strength “14” imprinted on one side and engraved with corporate logo on the other side. Each tablet contains 14 mg of teriflunomide. The 7 mg tablet is very light greenish-blue to pale greenish-blue, hexagonal film-coated tablet with dose strength “7” imprinted on one side and engraved with corporate logo on the other side. Each tablet contains 7 mg of teriflunomide. AUBAGIO 14 mg tablets are supplied as:

- NDC 58468-0210-2 Carton of 28 tablets containing 1 wallet composed of 2 folded blister cards of 14 tablets per blister card
- NDC 58468-0210-4 Carton containing a bottle of 30 tablets
- NDC 58468-0210-1 Carton of 5 tablets with one blister card with five tablets

AUBAGIO 7 mg tablets are supplied as:

- NDC 58468-0211-1 Carton of 28 tablets containing 1 wallet composed of 2 folded blister cards of 14 tablets per blister card
- NDC 58468-0211-4 Carton containing a bottle of 30 tablets
- NDC 58468-0211-2 Carton of 5 tablets with one blister card with five tablets

Store at 68°F to 77°F (20°C to 25°C) with excursions permitted between 59°F and 86°F (15°C and 30°C).

17 PATIENT COUNSELING INFORMATION

Advise the patient to read the FDA-approved patient labeling (Medication Guide). A Medication Guide is required for distribution with AUBAGIO.

Hepatotoxicity

Inform patients that AUBAGIO may cause liver injury, which can be life-threatening, and that their liver enzymes will be checked before starting AUBAGIO and at least monthly for 6 months after starting AUBAGIO [see Dosage and Administration (2) and Warnings and Precautions (5.1)]. Advise patients that they should contact their physician if they have any unexplained jaundice, vomiting, abdominal pain, fatigue, anorexia, or jaundice or any dark urine.

Embryofetal Toxicity

• Advise females of reproductive potential to notify their healthcare provider immediately if a pregnancy occurs or is suspected and to use effective contraception during treatment with AUBAGIO and until the teriflunomide plasma concentration is verified to be less than 0.02 mg/L [see Warnings and Precautions (5.2, 5.3)]. Use in Specific Populations (8.1, 8.3), Clinical Pharmacology (10.3)

• Instruct men taking AUBAGIO and not wishing to father a child to use effective contraception to minimize any possible risk to the fetus; their female partners should also use effective contraception.

• Advise men wishing to father a child to discontinue use of AUBAGIO and undergo an accelerated elimination procedure.

Pregnancy Exposure Registry

There is a pregnancy exposure registry that monitors pregnancy outcomes in women exposed to AUBAGIO during pregnancy [see Use in Specific Populations (8.1)].

Availability of an Accelerated Elimination Procedure

Advise patients that AUBAGIO may stay in the blood for up to 2 years after the last dose and that an accelerated elimination procedure may be used if needed [see Warnings and Precautions (5.3)].

Risk of Infections

Inform patients that they may develop a lowering of their white blood cell counts and that their blood counts will be checked before starting AUBAGIO.

Inform patients that they may be more likely to get infections when taking AUBAGIO and that they should contact their physician if they develop symptoms of infection, particularly in case of fever [see Warnings and Precautions (5.4)].

Advise patients that the use of some vaccines should be avoided during treatment with AUBAGIO and for at least 6 months after discontinuation.

Hypersensitivity Reactions

Advise patients to discontinue AUBAGIO and seek immediate medical attention if any signs or symptoms of a hypersensitivity reaction occur [see Contraindications (4) and Warnings and Precautions (5.5)]. Signs and symptoms can include dyspnea, urticaria, angioedema involving the lips, eyes, throat, or tongue, or skin rash.

Serious Skin Reactions

Advise patients to discontinue AUBAGIO and seek immediate medical attention if any signs of a serious skin reaction, such as SJS or TEN, occur [see Warnings and Precautions (5.6)]. Signs and symptoms can include rash, mouth sores, blisters, or peeling skin.

DRESS/Multi-organ Hypersensitivity

Instruct patients and caregivers that a fever or rash associated with signs of other organ system involvement (e.g., lymphadenopathy, hepatic dysfunction) may be drug-related and should be reported to their healthcare provider immediately. AUBAGIO should be discontinued immediately if a serious hypersensitivity reaction is suspected [see Warnings and Precautions (5.7)].

Peripheral Neuropathy

Inform patients that they may develop peripheral neuropathy. Advise patients that they should contact their physician if they develop symptoms of peripheral neuropathy, such as numbness or tingling of hands or feet [see Warnings and Precautions (5.8)].

Increased Blood Pressure

Inform patients that AUBAGIO may increase blood pressure [see Warnings and Precautions (5.9)].

Lactation

Advise females not to breastfeed during treatment with AUBAGIO [see Use in Specific Populations (8.2)].

Manufactured for:

Genzyme Corporation
Cambridge, MA 02142
A SANOFCi COMPANY
Medication Guide

AUBAGIO® (oh-BAH-gee-oh) (teriflunomide) tablets, for oral use

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

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

AUBAGIO may cause serious side effects, including:

- Liver problems: AUBAGIO may cause serious liver problems, including liver failure that can be life-threatening and may require a liver transplant. Your risk of developing serious liver problems may be higher if you already have liver problems or take other medicines that also affect your liver. Your doctor should do blood tests to check your liver:
  - within 6 months before you start taking AUBAGIO
  - 1 time a month for 6 months after you start taking AUBAGIO

Call your doctor right away if you have any of the following symptoms of liver problems:
- nausea
- vomiting
- stomach pain
- loss of appetite
- tiredness
- your skin or the whites of your eyes turn yellow
- dark urine

- Harm to your unborn baby: AUBAGIO may cause harm to your unborn baby. Do not take AUBAGIO if you are pregnant. Do not take AUBAGIO unless you are using effective birth control.
  - If you are a female, you should have a pregnancy test before you start taking AUBAGIO. Use effective birth control during your treatment with AUBAGIO.
  - After stopping AUBAGIO, continue using effective birth control until you have blood tests to make sure your blood levels of AUBAGIO are low enough. If you become pregnant while taking AUBAGIO or within 2 years after you stop taking it, tell your doctor right away.
  - AUBAGIO Pregnancy Registry. If you become pregnant while taking AUBAGIO or during the 2 years after you stop taking AUBAGIO, talk to your doctor about enrolling in the AUBAGIO Pregnancy Registry at 1-800-745-4447, option 2. The purpose of this registry is to collect information about your health and your baby’s health.
  - For men taking AUBAGIO:
    - If your female partner plans to become pregnant, you should stop taking AUBAGIO and ask your doctor how to quickly lower the levels of AUBAGIO in your blood.
    - If your female partner does not plan to become pregnant, you and your female partner should use effective birth control during your treatment with AUBAGIO. AUBAGIO remains in your blood after you stop taking it, so continue using effective birth control until AUBAGIO blood levels have been checked and they are low enough.

AUBAGIO may stay in your blood for up to 2 years after you stop taking it. Your doctor can prescribe a medicine to help lower your blood levels of AUBAGIO more quickly. Talk to your doctor if you want more information about this.

What is AUBAGIO?

- AUBAGIO is a prescription medicine used to treat relapsing forms of multiple sclerosis (MS), to include clinically isolated syndrome, relapsing-remitting disease, and active secondary progressive disease, in adults.
- It is not known if AUBAGIO is safe and effective in children.

Who should not take AUBAGIO?

Do not take AUBAGIO if you:
- have severe liver problems.
- are pregnant or are of childbearing age and not using effective birth control.
- have had an allergic reaction to leflunomide, teriflunomide, or any other ingredients in AUBAGIO. Please see the end of this Medication Guide for a list of ingredients in AUBAGIO.
- take a medicine called leflunomide.

What should I tell my doctor before taking AUBAGIO?

Before you take AUBAGIO, tell your doctor about all of your medical conditions, including if you:
- have liver or kidney problems.
- have a fever or infection, or you are unable to fight infections.
- have numbness or tingling in your hands or feet that is different from your MS symptoms.
- have diabetes.
- have had serious skin problems when taking other medicines.
- have breathing problems.
- have high blood pressure.
- are breastfeeding or plan to breastfeed. It is not known if AUBAGIO passes into your breast milk. You and your doctor should decide if you will take AUBAGIO or breastfeed. You should not do both.

Tell your doctor about all the medicines you take, including prescription and over-the-counter medicines, vitamins, and herbal supplements. Using AUBAGIO and other medicines may affect each other causing serious side effects. AUBAGIO may affect the way other medicines work, and other medicines may affect how AUBAGIO works.

Especially tell your doctor if you take medicines that could raise your chance of getting infections, including medicines used to treat cancer or to control your immune system.

Ask your doctor or pharmacist for a list of these medicines if you are not sure.

Know the medicines you take. Keep a list of them to show your doctor or pharmacist when you get a new medicine.

How should I take AUBAGIO?

- Take AUBAGIO exactly as your doctor tells you to take it.
- Take AUBAGIO 1 time each day.
- Take AUBAGIO with or without food.
What are possible side effects of AUBAGIO?

AUBAGIO may cause serious side effects, including:
- see "What is the most important information I should know about AUBAGIO?"
- decreases in your white blood cell count. Your white blood cell counts should be checked before you start taking AUBAGIO. When you have a low white blood cell count you:
  o may have more frequent infections. You should have a skin test for TB (tuberculosis) before you start taking AUBAGIO. Tell your doctor if you have any of these symptoms of an infection:
    - fever
    - tiredness
    - body aches
    - chills
    - nausea
    - vomiting
  o should not receive certain vaccinations during your treatment with AUBAGIO and for 6 months after your treatment with AUBAGIO ends.
- allergic reactions. Call your doctor right away or get emergency medical help if you have difficulty breathing, itching, swelling on any part of your body including in your lips, eyes, throat, or tongue.
- serious skin reactions. AUBAGIO may cause serious skin reactions that may lead to death. Stop taking AUBAGIO and call your doctor right away or get emergency medical help if you have any of the following symptoms: rash or redness and peeling, mouth sores or blisters.
- other types of allergic reactions or serious problems that may affect different parts of the body such as your liver, kidneys, heart, or blood cells. You may or may not have a rash with these types of reactions. Other symptoms you may have are:
  o fever
  o severe muscle pain
  o swollen lymph glands
  o swelling of your face
  o unusual bruising or bleeding
  o weakness or tiredness
  o yellowing of your skin or the white part of your eyes
- numbness or tingling in your hands or feet that is different from your MS symptoms. You have a higher chance of getting these symptoms if you:
  o are over 60 years of age
  o take certain medicines that affect your nervous system
  o have diabetes
  Tell your doctor if you have numbness or tingling in your hands or feet that is different from your MS.
- high blood pressure. Your doctor should check your blood pressure before you start taking AUBAGIO and while you are taking AUBAGIO.
- new or worsening breathing problems. These may be serious and lead to death. Call your doctor right away or get emergency medical help if you have shortness of breath or coughing with or without fever.

The most common side effects of AUBAGIO include:
- headache
- diarrhea
- nausea
- hair thinning or loss (alopecia)
- increases in the results of blood tests to check your liver function

These are not all the possible side effects of AUBAGIO. For more information, ask your doctor or pharmacist. Call your doctor for medical advice about side effects. You may report side effects to FDA at 1-800-FDA-1088.