

NDA 20-330

S-011

NDA 20-330/S-011

Merck & Co., Inc.
Attention: William G. Roberts, M.D.
Director Regulatory Affairs
Sunneytown Pike
West Point, PA 19486

MAR 18 1998

Dear Dr. Roberts:

Please refer to your supplemental new drug application dated December 18, 1997, received December 22, 1997, submitted under section 505(b) of the Federal Food, Drug, and Cosmetic Act for TIMOPTIC-XE® (timolol maleate ophthalmic gel forming solution).

The supplemental application provides for revisions to the Precautions and Adverse Reactions sections of the package insert.

We have completed the review of this supplemental application and have concluded that adequate information has been presented to demonstrate that the drug is safe and effective for use as recommended in the final printed labeling submitted on December 18, 1997. Accordingly, the supplemental application is approved effective on the date of this letter.

However, we have the following recommended revisions:

1. The generic name printed at the top of each column of the package insert and in the Instructions for Use should be revised so that it is in all lower case letters, as "timolol maleate ophthalmic solution."
2. The Geriatric Use subsection of the Precautions section should be deleted.
3. Under HYPERSENSITIVITY in the Adverse Events section, "systemic" should be inserted before "allergic reactions."
4. In the third paragraph of the Overdosage section, the dosage form, "tablets," should be added to the generic name of BLOCADREN.
5. The fourth paragraph of the Overdosage section is a sentence beginning "Significant lethality was observed..." This sentence may be deleted.

Should additional information relating to the safety and effectiveness of the drug become available, revision of the labeling may be required.

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In addition, please submit three copies of the introductory promotional material that you propose to use for this product. All proposed materials should be submitted in draft or mock-up form, not final print. Please submit one copy to this Division and two copies of both the promotional material and the package insert directly to:

Division of Drug Marketing, Advertising and Communications, HFD-40
Food and Drug Administration
5600 Fishers Lane
Rockville, Maryland 20857

Should a letter communicating important information about this drug product (i.e., a "Dear Doctor" letter) be issued to physicians and others responsible for patient care, we request that you submit a copy of the letter to this NDA and a copy to the following address:

MEDWATCH, HF-2
FDA
5600 Fishers Lane
Rockville, MD 20857

Please submit one market package of the drug product when it is available.

We remind you that you must comply with the requirements for an approved NDA set forth under 21 CFR 314.80 and 314.81.

If you have any questions, please contact Joanne M. Holmes, M.B.A., Clinical Reviewer, at (301) 827-2090.

Sincerely,

MAC 3/18/98

Wiley A. Chambers, M.D.
Deputy Director
Division of Anti-Inflammatory, Analgesic, and
Ophthalmic Drug Products, HFD-550
Office of Drug Evaluation V
Center for Drug Evaluation and Research

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cc:

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HFD-550/Div. files

HFD-550/Dep Dir/Chambers (with labeling)

HFD-550/MO/Ludwig (with labeling)

HFD-550/Clin Rev/Holmes (with labeling) 3/2/98

HFD-550/Proj Mgr/Gorski (with labeling) 3/16/98

DISTRICT OFFICE

HF-2/Medwatch (with labeling)

HFD-92/DDM-DIAB (with labeling)

HFD-40/DDMAC (with labeling)

HFD-613/OGD (with labeling)

HFD-735/DPE (with labeling)

HFI-20/Press Office (with labeling)

Drafted by: jh/March 3, 1998/20330s11.ap

Initialed by:

final:

APPROVAL (AP)

Clinical Review of NDA 20-330
Labeling Supplement

MAR 3 1998

NDA 20-330/S-011

Submission Date: 12/18/97
Receipt Date: 12/22/97
Review Date: 3/3/98

Applicant: Merck & Co.
Sumneytown Pike
West Point, PA 19486

Applicant's Representative: William G. Roberts, M.D.
Director, Regulatory Affairs
610-397-7052

Drug: TIMOPTIC-XE® (timolol maleate ophthalmic gel forming solution)

Pharmacologic Category: Non-selective Beta adrenergic receptor blocking agent

Related Review: Medical Officer's Review #2 of NDA 20-869, Cosopt (dorzolamide hydrochloride and timolol maleate ophthalmic solution), dated 2/12/98.

Submitted: A Special Supplement-Changes Being Effected containing revised labeling (as FPL) with additions and revisions to the Precautions and Adverse Reactions sections.

Following is the labeling submitted by the company. Reviewer recommended deletions are noted by ~~strikeout~~ and additions by shading within the review.

STERILE OPHTHALMIC
GEL FORMING SOLUTION

TIMOPTIC-XE®

0.25% AND 0.5%

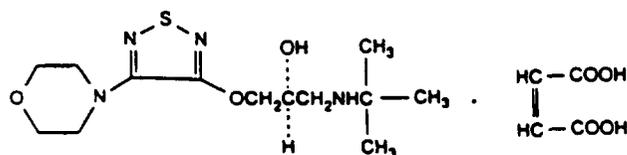
(TIMOLOL MALEATE OPHTHALMIC
GEL FORMING SOLUTION)

DESCRIPTION

TIMOPTIC-XE* (timolol maleate ophthalmic gel forming solution) is a non-selective beta-adrenergic receptor blocking agent. Its chemical name is (-)-1-(*tert*-butylamino)-3-[(4-morpholino-1,2,5-thiadiazol-3-yl)oxy]-2-propanol maleate (1:1) (salt). Timolol maleate possesses an asymmetric carbon atom in its structure and is provided as the levo-isomer. The nominal optical rotation of timolol maleate is:

$[\alpha]_{405}^{25}$ in 0.1N HCl (C=5%) = -12.2°.

Its molecular formula is $C_{13}H_{24}N_4O_3S \cdot C_4H_4O_4$ and its structural formula is:



Timolol maleate has a molecular weight of 432.50. It is a white, odorless, crystalline powder which is soluble in water, methanol, and alcohol.

TIMOPTIC-XE Sterile Ophthalmic Gel Forming Solution is supplied as a sterile, isotonic, buffered, aqueous solution of timolol maleate in two dosage strengths. Each mL of TIMOPTIC-XE 0.25% contains 2.5 mg of timolol (3.4 mg of timolol maleate). Each mL of TIMOPTIC-XE 0.5% contains 5.0 mg of timolol (6.8 mg of timolol maleate). Inactive ingredients: GELRITE* gellan gum, tromethamine, mannitol, and water for injection. Preservative: benzododecinium bromide 0.012%.

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GELRITE is a purified anionic heteropolysaccharide derived from gellan gum. An aqueous solution of GELRITE, in the presence of a cation, has the ability to gel. Upon contact with the precorneal tear film, TIMOPTIC-XE forms a gel that is subsequently removed by the flow of tears.

CLINICAL PHARMACOLOGY

Mechanism of Action

Timolol maleate is a beta₁ and beta₂ (non-selective) adrenergic receptor blocking agent that does not have significant intrinsic sympathomimetic, direct myocardial depressant, or local anesthetic (membrane-stabilizing) activity.

TIMOPTIC-XE, when applied topically on the eye, has the action of reducing elevated, as well as normal intraocular pressure, whether or not accompanied by glaucoma. Elevated intraocular pressure is a major risk factor in the pathogenesis of glaucomatous visual field loss and optic nerve damage.

The precise mechanism of the ocular hypotensive action of TIMOPTIC-XE is not clearly established at this time. Tonography and fluorophotometry studies of TIMOPTIC* (timolol maleate ophthalmic solution) in man suggest that its predominant action may be related to reduced aqueous formation. However, in some studies, a slight increase in outflow facility was also observed.

Beta-adrenergic receptor blockade reduces cardiac output in both healthy subjects and patients with heart disease. In patients with severe impairment of myocardial function beta-adrenergic receptor blockade may inhibit the stimulatory effect of the sympathetic nervous system necessary to maintain adequate cardiac function.

Beta-adrenergic receptor blockade in the bronchi and bronchioles results in increased airway resistance from unopposed parasympathetic activity. Such an effect in patients with asthma or other bronchospastic conditions is potentially dangerous.

Pharmacokinetics

In a study of plasma drug concentration in six subjects, the systemic exposure to timolol was determined following once daily administration of TIMOPTIC-XE 0.5% in the morning. The mean peak plasma concentration following this morning dose was 0.28 ng/mL.

Clinical Studies

In controlled, double-masked, multicenter clinical studies, comparing TIMOPTIC-XE 0.25% to TIMOPTIC 0.25% and TIMOPTIC-XE 0.5% to TIMOPTIC 0.5%, TIMOPTIC-XE administered once a day was shown to be equally effective in lowering intraocular pressure as the equivalent concentration of TIMOPTIC administered twice a day. The effect of timolol in lowering intraocular pressure was evident for 24 hours with a single dose of TIMOPTIC-XE. Repeated observations over a period of six months indicate that the intraocular pressure-lowering effect of TIMOPTIC-XE was consistent. The results from the largest U.S. and international clinical trials comparing TIMOPTIC-XE 0.5% to TIMOPTIC 0.5% are shown in Figure 1.

Figure 1
Mean IOP and Std Deviation
(mm Hg) by Treatment Group

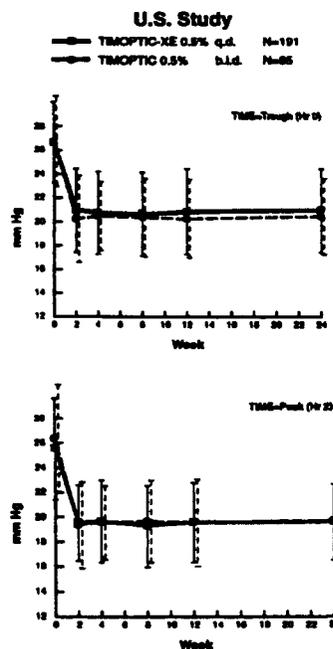
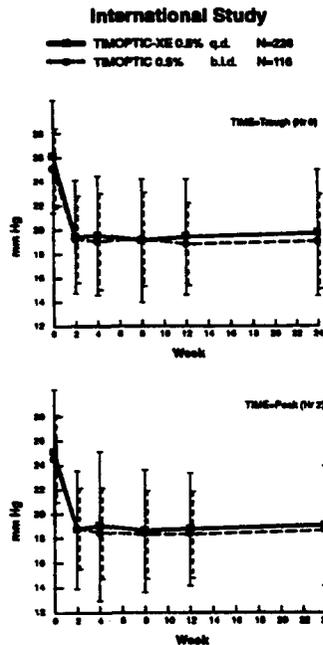


Figure 1 (Continued)
Mean IOP and Std Deviation
(mm Hg) by Treatment Group



TIMOPTIC-XE administered once daily had a safety profile similar to that of an equivalent concentration of TIMOPTIC administered twice daily. Due to the physical characteristics of the formulation, there was a higher incidence of transient blurred vision in patients administered TIMOPTIC-XE. A slight reduction in resting heart rate was observed in some patients receiving TIMOPTIC-XE 0.5% (mean reduction 24 hours post-dose 0.8 beats/minute, mean reduction 2 hours post-dose 3.8 beats/minute). (See ADVERSE REACTIONS.)

TIMOPTIC-XE has not been studied in patients wearing contact lenses.

INDICATIONS AND USAGE

TIMOPTIC-XE Sterile Ophthalmic Gel Forming Solution is indicated in the treatment of elevated intraocular pressure in patients with ocular hypertension or open-angle glaucoma.

CONTRAINDICATIONS

TIMOPTIC-XE is contraindicated in patients with (1) bronchial asthma; (2) a history of bronchial asthma; (3) severe chronic obstructive pulmonary disease (see WARNINGS); (4) sinus bradycardia; (5) second or third degree atrioventricular block; (6) overt cardiac failure (see WARNINGS); (7) cardiogenic shock; or (8) hypersensitivity to any component of this product.

WARNINGS

As with many topically applied ophthalmic drugs, this drug is absorbed systemically.

The same adverse reactions found with systemic administration of beta-adrenergic blocking agents may occur with topical ophthalmic administration. For example, severe respiratory reactions and cardiac reactions, including death due to bronchospasm in patients with asthma, and rarely death in association with cardiac failure, have been reported following systemic or ophthalmic administration of timolol maleate. (See CONTRAINDICATIONS.)

Cardiac Failure

Sympathetic stimulation may be essential for support of the circulation in individuals with diminished myocardial contractility, and its inhibition by beta-adrenergic receptor blockade may precipitate more severe failure.

In Patients Without a History of Cardiac Failure, continued depression of the myocardium with beta-blocking agents over a period of time can, in some cases, lead to cardiac failure. At the first sign or symptom of cardiac failure, TIMOPTIC-XE should be discontinued.

Obstructive Pulmonary Disease

Patients with chronic obstructive pulmonary disease (e.g., chronic bronchitis, emphysema) of mild or moderate severity, bronchospastic disease, or a history of bronchospastic disease (other than bronchial asthma or a history of bronchial asthma, in which TIMOPTIC-XE is contraindicated [see CONTRAINDICATIONS]) should, in general, not receive beta-blockers, including TIMOPTIC-XE.

Major Surgery

The necessity or desirability of withdrawal of beta-adrenergic blocking agents prior to major surgery is controversial. Beta-adrenergic receptor blockade impairs the ability of the heart to respond to beta-adrenergically mediated reflex stimuli. This may augment the risk of general anesthesia in surgical procedures. Some patients receiving beta-adrenergic receptor blocking agents have experienced protracted, severe hypotension during anesthesia. Difficulty in restarting and maintaining the heartbeat has also been reported. For these reasons, in patients undergoing elective surgery, some authorities recommend gradual withdrawal of beta-adrenergic receptor blocking agents.

If necessary during surgery, the effects of beta-adrenergic blocking agents may be reversed by sufficient doses of adrenergic agonists.

Diabetes Mellitus

Beta-adrenergic blocking agents should be administered with caution in patients subject to spontaneous hypoglycemia or to diabetic patients (especially those with labile diabetes) who are receiving insulin or oral hypoglycemic agents. Beta-adrenergic receptor blocking agents may mask the signs and symptoms of acute hypoglycemia.

Thyrotoxicosis

Beta-adrenergic blocking agents may mask certain clinical signs (e.g., tachycardia) of hyperthyroidism. Patients suspected of developing thyrotoxicosis should be managed carefully to avoid abrupt withdrawal of beta-adrenergic blocking agents that might precipitate a thyroid storm.

PRECAUTIONS

General

Because of potential effects of beta-adrenergic blocking agents on blood pressure and pulse, these agents should be used with caution in patients with cerebrovascular insufficiency. If signs or symptoms suggesting reduced cerebral blood flow develop following initiation of therapy with TIMOPTIC-XE, alternative therapy should be considered.

There have been reports of bacterial keratitis associated with the use of multiple dose containers of topical ophthalmic products. These containers had been inadvertently contaminated by patients who, in most cases, had a concurrent corneal disease or a disruption of the ocular epithelial surface. (See PRECAUTIONS, *Information for Patients*.)

Choroidal detachment after filtration procedures has been reported with the administration of aqueous suppressant therapy (e.g. timolol).

Angle-closure glaucoma: In patients with angle-closure glaucoma, the immediate objective of treatment is to reopen the angle. This may require constricting the pupil. Timolol maleate has little or no effect on the pupil. TIMOPTIC-XE should not be used alone in the treatment of angle-closure glaucoma.

Anaphylaxis: While taking beta-blockers, patients with a history of atopy or a history of severe anaphylactic reactions to a variety of allergens may be more reactive to repeated accidental, diagnostic, or therapeutic challenge with such allergens. Such patients may be unresponsive to the usual doses of epinephrine used to treat anaphylactic reactions.

Muscle Weakness: Beta-adrenergic blockade has been reported to potentiate muscle weakness consistent with certain myasthenic symptoms (e.g., diplopia, ptosis, and generalized weakness). Timolol has been reported rarely to increase muscle weakness in some patients with myasthenia gravis or myasthenic symptoms.

Information for Patients

Patients should be instructed to avoid allowing the tip of the dispensing container to contact the eye or surrounding structures.

Patients should also be instructed that ocular solutions, if handled improperly, or if the tip of the dispensing container contacts the eye or surrounding structures, can become contaminated by common bacteria known to cause ocular infections. Serious damage to the eye and subsequent loss of vision may result from using contaminated solutions. (See PRECAUTIONS, *General*.)

Reviewer's comments: *The following was added to the first sentence for consistency with other Merck ophthalmic labeling: "or if the tip of the dispensing container contacts the eye or surrounding structures."*
Acceptable.

Patients should also be advised that if they have ocular surgery or develop an intercurrent ocular condition (e.g., trauma or infection), they should immediately seek their physician's advice concerning the continued use of the present multidose container.

Reviewer's comments: *Editorial revision to remove ocular surgery from the parentheses, consistent with Timoptic Ophthalmic Solution. Acceptable.*

Patients should be instructed to invert the closed container and shake once before each use. It is not necessary to shake the container more than once.

Patients requiring concomitant topical ophthalmic medications should be instructed to administer these at least 10 minutes before instilling TIMOPTIC-XE.

Patients with bronchial asthma, a history of bronchial asthma, severe chronic obstructive pulmonary disease, sinus bradycardia, second or third degree atrioventricular block, or cardiac failure should be advised not to take this product. (See CONTRAINDICATIONS.)

Transient blurred vision, generally lasting from 30 seconds to 5 minutes, following installation, and potential visual disturbances may impair the ability to perform hazardous tasks such as operating machinery or driving a motor vehicle.

Reviewer's comments: *Added for patient safety. Acceptable.*

Drug Interactions

Beta-adrenergic blocking agents: Patients who are receiving a beta-adrenergic blocking agent orally and TIMOPTIC-XE should be observed for potential additive effects of beta-blockade, both systemic and on intraocular pressure. The concomitant use of two topical beta-adrenergic blocking agents is not recommended.

Reviewer's comments: *The second sentence above was added for consistency with Timoptic Ophthalmic Solution and Timoptic Ophthalmic Solution in Ocudose. Acceptable.*

Calcium antagonists: Caution should be used in the coadministration of beta-adrenergic blocking agents, such as TIMOPTIC-XE, and oral or intravenous calcium antagonists because of possible atrioventricular conduction disturbances, left ventricular failure, or hypotension. In patients with impaired cardiac function, coadministration should be avoided.

Catecholamine-depleting drugs: Close observation of the patient is recommended when a beta blocker is administered to patients receiving catecholamine-depleting drugs such as reserpine, because of possible additive effects and the production of hypotension and/or marked bradycardia, which may result in vertigo, syncope, or postural hypotension.

Digitalis and calcium antagonists: The concomitant use of beta-adrenergic blocking agents with digitalis and calcium antagonists may have additive effects in prolonging atrioventricular conduction time.

Quinidine: Potentiated systemic beta-blockade (e.g., decreased heart rate) has been reported during combined treatment with quinidine and timolol, possibly because quinidine inhibits the metabolism of timolol via the P-450 enzyme, CYP2D6.

Reviewer's comments: *The precaution on quinidine has been added. Supporting literature and Worldwide Experience System (WAES) Reports were provided. Acceptable.*

Injectable Epinephrine: (See PRECAUTIONS, General, Anaphylaxis)

Carcinogenesis, Mutagenesis, Impairment of Fertility

In a two-year study of timolol maleate administered orally to rats, there was a statistically significant increase in the incidence of adrenal pheochromocytomas in male rats administered 300 mg/kg/day (approximately 42,000 times the systemic exposure following the maximum recommended human ophthalmic dose). Similar differences were not observed in rats administered oral doses equivalent to approximately 14,000 times the maximum recommended human ophthalmic dose.

In a lifetime oral study in mice, there were statistically significant increases in the incidence of benign and malignant pulmonary tumors, benign uterine polyps, and mammary adenocarcinomas in female mice at 500 mg/kg/day (approximately 71,000 times the systemic exposure following the maximum recommended human ophthalmic dose), but not at 5 or 50 mg/kg/day (approximately 700 or 7,000, respectively, times the systemic exposure following the maximum recommended human ophthalmic dose). In a subsequent study in female mice, in which postmortem examinations were limited to the uterus and the lungs, a statistically significant increase in the incidence of pulmonary tumors was again observed at 500 mg/kg/day.

The increased occurrence of mammary adenocarcinomas was associated with elevations in serum prolactin, which occurred in female mice administered oral timolol at 500 mg/kg/day, but not at oral doses of 5 or 50 mg/kg/day. An increased incidence of mammary adenocarcinomas in rodents has been associated with administration of several other therapeutic agents that elevate serum prolactin, but no correlation between serum prolactin levels and mammary tumors has been established in humans. Furthermore, in adult human female subjects who received oral dosages of up to 60 mg of timolol maleate (the maximum recommended human oral dosage), there were no clinically meaningful changes in serum prolactin.

Timolol maleate was devoid of mutagenic potential when tested *in vivo* (mouse) in the micronucleus test and cytogenetic assay (doses up to 800 mg) and *in vitro* in a neoplastic cell transformation assay (up to 100 µg/mL). In Ames tests, the highest concentrations of timolol employed, 5,000 or 10,000 µg/plate, were associated with statistically significant elevations of revertants observed with tester strain TA 100 (in seven replicate assays), but not in the remaining three strains. In the assays with tester strain TA 100, no consistent dose response relationship was observed, and the ratio of test to control revertants did not reach 2. A ratio of 2 is usually considered the criterion for a positive Ames test.

Reproduction and fertility studies in rats demonstrated no adverse effect on male or female fertility at doses up to 21,000 times the systemic exposure following the maximum recommended human ophthalmic dose.

Pregnancy-Teratogenic effects:

Pregnancy Category C. Teratogenicity studies with timolol in mice, rats, and rabbits at oral doses up to 50 mg/kg/day (7,000 times the systemic exposure following the maximum recommended human ophthalmic dose) demonstrated no evidence of fetal malformations. Although delayed fetal ossification was observed at this dose in rats, there were no adverse effects on postnatal development of offspring. Doses of 1000 mg/kg/day (142,000 times the systemic exposure following the maximum recommended human ophthalmic dose) were maternotoxic in mice and resulted in an increased number of fetal resorptions. Increased fetal resorptions were also seen in rabbits at doses of 14,000 times the systemic exposure following

the maximum recommended human ophthalmic dose, in this case without apparent maternotoxicity.

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

Nursing Mothers

Timolol maleate has been detected in human milk following oral and ophthalmic drug administration. Because of the potential for serious adverse reactions from TIMOPTIC-XE in nursing infants, a decision should be made whether to discontinue nursing or to discontinue the drug, taking into account the importance of the drug to the mother.

Pediatric Use

Safety and effectiveness in pediatric patients have not been established.

Reviewer's comments: *Geriatric subsection deleted for consistency with other Timoptic labeling.*

ADVERSE REACTIONS

In clinical trials, transient blurred vision upon instillation of the drop was reported in approximately one in three patients (lasting from 30 seconds to 5 minutes). Less than 1% of patients discontinued from the studies due to blurred vision. The frequency of patients reporting burning and stinging upon instillation was comparable between TIMOPTIC-XE and TIMOPTIC (approximately one in eight patients).

Adverse experiences reported in 1-5% of patients were:

Ocular: Pain, conjunctivitis, discharge (e.g., crusting), foreign body sensation, itching and tearing;

Systemic: Headache, dizziness, and upper respiratory infections.

Reviewer's comments: *Some adverse events previously listed under oral timolol have now been seen with timolol ophthalmic solution. They have been moved into the appropriate body systems in the paragraphs for timolol ophthalmic.*
Adverse events newly reported for timolol ophthalmic, and not previously noted for oral timolol, have been added to the appropriate body system in the paragraph on oral timolol.
The changes are acceptable.

The following additional adverse experiences have been reported with the ocular administration of this or other timolol maleate formulations:

BODY AS A WHOLE

Asthenia/fatigue, and chest pain.

CARDIOVASCULAR

Bradycardia, arrhythmia, hypotension, hypertension, syncope, heart block, cerebral vascular accident, cerebral ischemia, cardiac failure, worsening of angina pectoris, palpitation, cardiac arrest, pulmonary edema, edema, claudication, Raynaud's phenomenon, and cold hands and feet.

Reviewer's comments: *Edema, claudication, Raynaud's phenomenon, and cold hands and feet were moved from the oral timolol paragraph.*

DIGESTIVE

Nausea, diarrhea, dyspepsia, anorexia, and dry mouth.

IMMUNOLOGIC

Systemic lupus erythematosus.

NERVOUS SYSTEM/PSYCHIATRIC

Increase in signs and symptoms of myasthenia gravis, paresthesia, somnolence, insomnia, nightmares, behavioral changes and psychic disturbances including depression, confusion, hallucinations, anxiety, disorientation, nervousness, and memory loss.

Reviewer's comments: *The above subsection was rearranged. Insomnia, nightmares, and memory loss were moved from the oral timolol paragraph.*

SKIN

Alopecia and psoriasiform rash or exacerbation of psoriasis.

HYPERSENSITIVITY

Signs and symptoms of ~~systemic~~ allergic reactions, including angioedema, urticaria, and localized and generalized rash.

Reviewer's comments: *Alopecia and psoriasiform rash or exacerbation of psoriasis were added under Skin. Hypersensitivity is now a distinct paragraph, incorporating what had been under Skin, and adding angioedema.*

RESPIRATORY

Bronchospasm (predominantly in patients with pre-existing bronchospastic disease), respiratory failure, dyspnea, nasal congestion, and cough.

ENDOCRINE

Masked symptoms of hypoglycemia in diabetic patients (see WARNINGS).

SPECIAL SENSES

Signs and symptoms of ocular irritation including blepharitis, keratitis and dry eyes; ptosis; decreased corneal sensitivity; cystoid macular edema; visual disturbances including refractive changes and diplopia; pseudophthalmos; choroidal detachment following filtration surgery (see PRECAUTIONS, *General*); and tinnitus.

UROGENITAL

Retroperitoneal fibrosis, decreased libido, impotence, and Peyronie's disease.

Reviewer's comments *Decreased libido and Peyronie's disease were moved from the oral timolol paragraph.*

The following additional adverse effects have been reported in clinical experience with ORAL timolol maleate or other ORAL beta-blocking agents and may be considered potential effects of ophthalmic timolol maleate: *Allergic:* Erythematous rash, fever combined with aching and sore throat, laryngospasm with respiratory distress; *Body as a Whole:* Extremity pain, decreased exercise tolerance, weight loss; *Cardiovascular:* Worsening of arterial insufficiency, vasodilatation; *Digestive:* Gastrointestinal pain, hepatomegaly, vomiting, mesenteric arterial thrombosis, ischemic colitis; *Hematologic:* Nonthrombocytopenic purpura, thrombocytopenic purpura, agranulocytosis; *Endocrine:* Hyperglycemia, hypoglycemia; *Skin:* Pruritus, skin irritation, increased pigmentation, sweating; *Musculoskeletal:* Arthralgia; *Nervous System/Psychiatric:* Vertigo, local weakness, diminished concentration, reversible mental depression progressing to catatonia, an acute reversible syndrome characterized by disorientation for time and place, emotional lability, slightly clouded sensorium, and decreased performance on neuropsychometrics; *Respiratory:* Rales, bronchial obstruction; *Urogenital:* Urination difficulties.

OVERDOSAGE

No data are available in regard to human overdosage with or accidental oral ingestion of TIMOPTIC-XE.

There have been reports of inadvertent overdosage with TIMOPTIC Ophthalmic Solution resulting in systemic effects similar to those seen with systemic beta-adrenergic blocking agents such as dizziness, headache, shortness of breath, bradycardia, bronchospasm, and cardiac arrest (see also ADVERSE REACTIONS).

Overdosage has been reported with Tablets BLOCADREN[®] (timolol maleate tablets). A 30 year old female ingested 650 mg of BLOCADREN (maximum recommended oral daily dose is 60 mg) and experienced second and third degree heart block. She recovered without treatment but approximately two months later developed irregular heartbeat, hypertension, dizziness, tinnitus, faintness, increased pulse rate, and borderline first degree heart block.

An *in vitro* hemodialysis study, using ¹⁴C timolol added to human plasma or whole blood, showed that timolol was readily dialyzed from these fluids; however, a study of patients with renal failure showed that timolol did not dialyze readily.

DOSAGE AND ADMINISTRATION

Patients should be instructed to invert the closed container and shake once before each use. It is not necessary to shake the container more than once. Other topically applied ophthalmic medications should be administered at least 10 minutes before TIMOPTIC-XE. (See PRECAUTIONS, *Information for Patients and accompanying INSTRUCTIONS FOR USE.*)

TIMOPTIC-XE Sterile Ophthalmic Gel Forming Solution is available in concentrations of 0.25% and 0.5%. The dose is one drop of TIMOPTIC-XE (either 0.25% or 0.5%) in the affected eye(s) once a day.

Because in some patients the pressure-lowering response to TIMOPTIC-XE may require a few weeks to stabilize, evaluation should include a determination of intraocular pressure after approximately 4 weeks of treatment with TIMOPTIC-XE.

Dosages higher than one drop of 0.5% TIMOPTIC-XE once a day have not been studied. If the patient's intraocular pressure is still not at a satisfactory level on this regimen, concomitant therapy can be considered. The concomitant use of two topical beta-adrenergic blocking agents is not recommended. (See PRECAUTIONS, *Drug Interactions, Beta-adrenergic blocking agents.*)

Reviewer's comments: *The last sentence above was added for consistency with Timoptic and Timoptic in Ocludose. Acceptable.*

When patients have been switched from therapy with TIMOPTIC administered twice daily to TIMOPTIC-XE administered once daily, the ocular hypotensive effect has remained consistent.

HOW SUPPLIED

TIMOPTIC-XE Sterile Ophthalmic Gel Forming Solution is a colorless to nearly colorless, slightly opalescent, and slightly viscous solution.

No. 3557 — TIMOPTIC-XE Sterile Ophthalmic Gel Forming Solution, 0.25% timolol equivalent, is supplied in OCUMETER[®], a white, opaque, plastic, ophthalmic dispenser with a controlled drop tip as follows:

NDC 0006-3557-32, 2.5 mL
(6505-01-388-0967, 0.25% 2.5 mL)
NDC 0006-3557-03, 5 mL
(6505-01-387-9495 0.25% 5 mL)

No. 3558 — TIMOPTIC-XE Sterile Ophthalmic Gel Forming Solution, 0.5% timolol equivalent, is supplied in OCUMETER, a white, opaque, plastic, ophthalmic dispenser with a controlled drop tip as follows:

NDC 0006-3558-32, 2.5 mL
(6505-01-338-0964 0.5% 2.5 mL)
NDC 0006-3558-03, 5 mL
(6505-01-337-9482 0.5% 5 mL)

Storage

Store between 15° and 25°C (59° and 77°F). **AVOID FREEZING.** Protect from light.

Issued June 1997

Printed in USA

TIMOPTIC-XE®

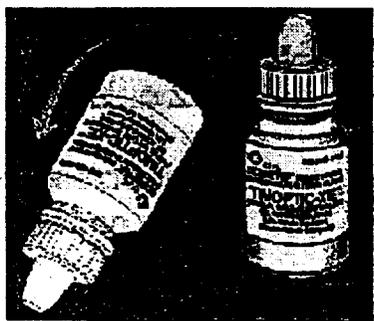
0.25% AND 0.5%

timolol maleate ophthalmic gel forming solution

INSTRUCTIONS FOR USE

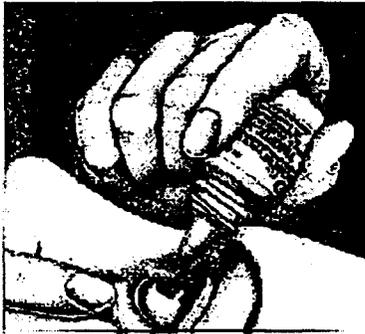
Please follow these instructions carefully when using TIMOPTIC-XE*. Use TIMOPTIC-XE as prescribed by your doctor.

1. If you use other topically applied ophthalmic medications, they should be administered at least 10 minutes before TIMOPTIC-XE.
2. Wash hands before each use.
3. Invert the closed bottle and shake ONCE before each use. (It is not necessary to shake the bottle more than once.)



4. Remove the cap from the bottle carefully so that the dispenser tip does not touch anything. Place the cap in a clean, dry area.

5. Hold the bottle between the thumb and index finger. Use the index finger of the other hand to pull down the lower eyelid to form a pocket for the eye drop. Tilt your head back.



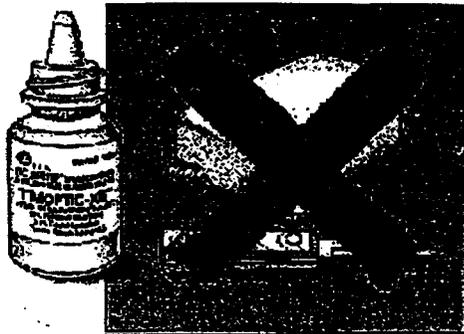
6. Place the dispenser tip close to your eye and gently squeeze the bottle to administer one drop. Remove pressure after a single drop has been released. If instructed, repeat steps 5 and 6 in the other eye.

DO NOT ALLOW THE DISPENSER TIP TO TOUCH THE EYE OR SURROUNDING AREAS.

Ophthalmic medications, if handled improperly, can become contaminated by common bacteria known to cause eye infections. Serious damage to the eye and subsequent loss of vision may result from using contaminated ophthalmic medications. If you think your medication may be contaminated, or you develop an eye infection, contact your doctor immediately concerning continued use of this bottle.

7. Replace the cap. Store the bottle at room temperature in an upright position in a clean area.
8. The dispenser tip is designed to provide a pre-measured drop; therefore, do NOT enlarge the hole of the dispenser.

9. Do NOT wash the tip of the dispenser with water, soap, or any other cleaner.



WARNING: Keep out of reach of children.

If you have any questions about the use of TIMOPTIC-XE, please consult your doctor.

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Issued June 1997

MERCK & CO., INC
West Point, PA 19486, USA

Recommendations: The changes proposed are acceptable, and an approval letter may be issued. Revisions noted in the review are recommendations that may be conveyed in the approval letter. They are not terms of approval. The revisions are as follows:

1. The generic name printed at the top of each column of the package insert and in the Instructions for Use, should be revised so that it is in all lower case letters, as timolol maleate ophthalmic solution.
2. The Geriatric Use subsection of the Precautions section should be deleted.
3. In the Adverse Events section, under HYPERSENSITIVITY, "systemic" should be inserted before "allergic reactions."
4. In the third paragraph of the Overdosage section, "tablets" should be added to the generic name of BLOCADREN to indicate the dosage form.
5. The fourth paragraph of the Overdosage section is a sentence beginning "Significant lethality was observed..." It may be deleted.

Joanne M. Holmes

Wiley A. Chambers, M.D.

cc:

NDA 20-330

HFD-550/Div files

HFD-550/Deputy Dir/Chambers

HFD-550/MO/Ludwig

HFD-550/Clin/Holmes *oek 3/15/98*

HFD-550/PMS/Gorski

HF-2/MedWatch



Food and Drug Administration
Rockville MD 20857

NDA 20-330/S-011

DEC 29 1997

Merck Research Laboratories
P.O. Box 4, BLA-20
West Point, PA 19486-0004

Attention: William G. Roberts, M.D.
Director, Regulatory Affairs

Dear Dr. Roberts:

We acknowledge receipt of your supplemental application for the following:

Name of Drug: TIMOPTIC-XE ®(timolol maleate ophthalmic gel forming solution)

NDA Number: 20-330

Supplement Number: S-011

Date of Supplement: December 18, 1997

Date of Receipt: December 22, 1997

Unless we find the application not acceptable for filing, this application will be filed under Section 505(b)(1) of the Act on February 20, 1998, in accordance with 21 CFR 314.101(a).

All communications concerning this NDA should be addressed as follows:

Division of Anti-Inflammatory, Analgesic and
Ophthalmic Drug Products, HFD-550
Attention: Document Control Room
Office of Drug Evaluation V
Center for Drug Evaluation and Research
Food and Drug Administration
5600 Fishers Lane
Rockville, MD 20857

Sincerely,

Chin Koerner 12/24/97

Chin Koerner, M.S.
Acting Supervisory Consumer Safety Officer
Division of Anti-Inflammatory, Analgesic and
Ophthalmic Drug Products, HFD-550
Office of Drug Evaluation V
Center for Drug Evaluation and Research

NDA 20-330/S-011
Page 2

cc:

Original NDA 20-330/S-011
HFD-550/Div. Files
HFD-550/CSO/Gorski, L.

SUPPLEMENT ACKNOWLEDGEMENT

William G. Roberts, M.D.
Director
Regulatory Affairs

NDA NO. 20330 REF. NO. SLK-011

NDA SUPPL FOR Labeling

ORIGINAL

Merck & Co., Inc.
P.O. Box 4, BLA-20
West Point PA 19486
Fax 610 397 2516
Tel 610 397 7052

December 18, 1997

These copies are
OFFICIAL FDA COPIES
not desk copies



Michael Weintraub, M.D., Acting Director
Division of Anti-Inflammatory, Analgesic and
Ophthalmic Drug Products - HFD-550
Office of Drug Evaluation V (CDER)
Food and Drug Administration
9201 Corporate Blvd.
Rockville, Maryland 20850



Dear Dr. Weintraub:

SPECIAL SUPPLEMENT - CHANGES BEING EFFECTED

NDA 18-086: Sterile Ophthalmic Solution TIMOPTIC®
NDA 19-463: Preservative-Free Sterile Ophthalmic Solution TIMOPTIC® in OCUDOSE®
NDA 20-330: Sterile Ophthalmic Gel Forming Solution TIMOPTIC-XE®

Pursuant to Section 505(b) of the Food Drug and Cosmetic Act and in accordance with 21 CFR 314.70 (c) we submit a supplement to NDA 20-330.

As indicated on the attached Form FDA 356h, this supplemental application provides for changes in Item 3 of the approved New Drug Application of Sterile Ophthalmic Gel Forming Solution TIMOPTIC-XE®. The revisions to the label are described in the Summary of Revisions attached to the cover letter.

Attached as Changes Being Effectuated are the following:

1. Printed package circular #9028708 (Issued June 1997)
2. Annotated circular, illustrating the revisions
3. Supporting literature

The circular has been revised as outlined in the summary of revisions.

The revised labeling will be used in all packaging on or before 3/1/98 and in all product sold or distributed on or before 7/1/98.

A complete field copy of this supplement has been submitted to the FDA Philadelphia District Office.

186-008
Gor...
550

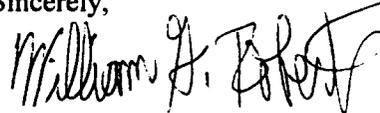
Michael Weintraub, M.D., Acting Director
NDA 18-086: TIMOPTIC®
NDA 19-463: TIMOPTIC® in OCUDOSE®
NDA 20-330: TIMOPTIC-XE®
Page 2

As required by Section 306(k)(1) of the Generic Enforcement Act [21 U.S.C. 335a(k)(1)], we hereby certify that, in connection with this application, Merck & Co., Inc. did not and will not use in any capacity the services of any person debarred under subsections 306(a) or (b) of the Act.

We consider the filing of this supplement to be a confidential matter and request that the Food and Drug Administration not make its content, nor any future communications in regard to it, public without first obtaining the written permission of Merck & Co., Inc.

Please direct questions or need for additional information to William G. Roberts, M.D. (610/397-7052) or, in my absence, Bonnie J. Goldmann, M.D. (610/397-2383).

Sincerely,



William G. Roberts, M.D.
Director
Regulatory Affairs

Attachments

Federal Express #1
Q/YAR/LAC/LTR/CBE-OPHT-3

Desk copy: Ms. Joanne Holmes, HFD-550, 9201 Corporate Blvd.
Federal Express #1

Desk Copy: Philadelphia District Office, FDA, U.S. Custom House
Room 900, 2nd & Chestnut Streets, Phila., PA 19106-2973
Federal Express # 2

MAR 18 1998
APPROVED



9028708

MERCK & CO., INC.
West Point, PA 19486, USA

TIMOPTIC-XE®
(Timolol Maleate Ophthalmic Gel Forming Solution)

lowering intraocular pressure was evident for 24 hours with a single dose of TIMOPTIC-XE. Repeated observations over a period of six months indicate that the intraocular pressure-lowering effect of TIMOPTIC-XE was consistent. The results from the largest U.S. and international clinical trials comparing TIMOPTIC-XE 0.5% to TIMOPTIC 0.5% are shown in Figure 1.

**STERILE OPHTHALMIC
GEL-FORMING SOLUTION
TIMOPTIC-XE®**
0.25% AND 0.5%

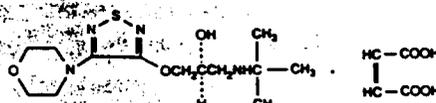
(TIMOLOL MALEATE OPHTHALMIC
GEL FORMING SOLUTION)

DESCRIPTION

TIMOPTIC-XE® (timolol maleate ophthalmic gel forming solution) is a non-selective beta-adrenergic receptor blocking agent. Its chemical name is (-)-1-(*tert*-butylamino)-3-[(4-morpholino-1,2,5-thiadiazol-3-yl)oxy]-2-propanol maleate (1:1) (salt). Timolol maleate possesses an asymmetric carbon atom in its structure and is provided as the levo-isomer. The nominal optical rotation of timolol maleate is:

$$[\alpha]_{25}^{405 \text{ nm}} \text{ in } 0.1\text{N HCl (C = 5\%)} = -12.2^\circ$$

Its molecular formula is $C_{13}H_{24}N_4O_5S \cdot C_4H_4O_4$ and its structural formula is:



Timolol maleate has a molecular weight of 432.50. It is a white, odorless, crystalline powder which is soluble in water, methanol, and alcohol.

TIMOPTIC-XE Sterile Ophthalmic Gel Forming Solution is supplied as a sterile, isotonic, buffered, aqueous solution of timolol maleate in two dosage strengths. Each mL of TIMOPTIC-XE 0.25% contains 2.5 mg of timolol (3.4 mg of timolol maleate). Each mL of TIMOPTIC-XE 0.5% contains 5.0 mg of timolol (6.8 mg of timolol maleate). Inactive ingredients: GELRITE® gellan gum, tromethamine, mannitol, and water for injection. Preservative: benzododecinium bromide 0.012%.

GELRITE is a purified anionic heteropolysaccharide derived from gellan gum. An aqueous solution of GELRITE, in the presence of a cation, has the ability to gel. Upon contact with the precorneal tear film, TIMOPTIC-XE forms a gel that is subsequently removed by the flow of tears.

CLINICAL PHARMACOLOGY

Mechanism of Action

Timolol maleate is a beta₁ and beta₂ (non-selective) adrenergic receptor blocking agent that does not have significant intrinsic sympathomimetic, direct myocardial depressant, or local anesthetic (membrane-stabilizing) activity.

TIMOPTIC-XE when applied topically on the eye, has the action of reducing elevated, as well as normal intraocular pressure, whether or not accompanied by glaucoma. Elevated intraocular pressure is a major risk factor in the pathogenesis of glaucomatous visual field loss and optic nerve damage.

The precise mechanism of the ocular hypotensive action of TIMOPTIC-XE is not clearly established at this time. Tonography and fluorophotometry studies of TIMOPTIC® (timolol maleate ophthalmic solution) in man suggest that its predominant action may be related to reduced aqueous formation. However, in some studies, a slight increase in outflow facility was also observed.

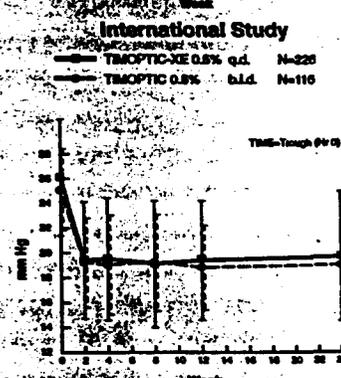
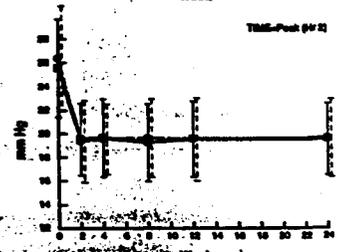
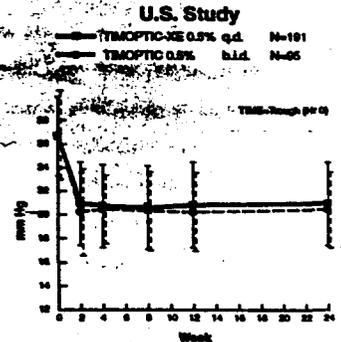
Beta adrenergic receptor blockade reduces cardiac output in both healthy subjects and patients with heart disease. In patients with severe impairment of myocardial function, beta adrenergic receptor blockade may inhibit the stimulatory effect of the sympathetic nervous system necessary to maintain adequate cardiac function.

Beta adrenergic receptor blockade in the bronchi and bronchioles results in increased airway resistance from unopposed parasympathetic activity. Such an effect in patients with asthma or other bronchospastic conditions is potentially dangerous.

Pharmacokinetics

In a study of plasma drug concentration in six subjects, the systemic exposure to timolol was determined following once daily administration of TIMOPTIC-XE 0.5% in the morning. The mean peak plasma concentration following this morning dose was 0.28 ng/mL.

Figure 1
Mean IOP and Std Deviation
(mm Hg) by Treatment Group



TIMOPTIC-XE administered once daily had a safety profile similar to that of an equivalent concentration of TIMOPTIC administered twice daily. Due to the physical characteristics of the formulation, there was a higher incidence of transient blurred vision in patients administered TIMOPTIC-XE. A slight reduction in resting heart rate was observed in some patients receiving TIMOPTIC-XE 0.5% (mean reduction 24 hours post-dose 0.8 beats/minute; mean reduction 2 hours post-dose 3.8 beats/minute). **ADVERSE REACTIONS** TIMOPTIC-XE has not been studied in patients wearing contact lenses.

INDICATIONS AND USAGE

TIMOPTIC-XE Sterile Ophthalmic Gel Forming Solution is indicated in the treatment of elevated intraocular pressure in patients with ocular hypertension or open-angle glaucoma.

CONTRAINDICATIONS

TIMOPTIC-XE is contraindicated in patients with (1) bron-

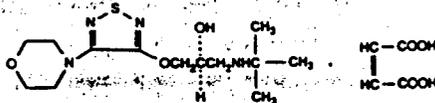
TIMOLOTICOL
0.25% AND 0.5%
(TIMOLOL MALEATE OPHTHALMIC
GEL FORMING SOLUTION)

DESCRIPTION

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TIMOPTIC-XE Sterile Ophthalmic Gel Forming Solution is supplied as a sterile, isotonic, buffered, aqueous solution of timolol maleate in two dosage strengths. Each mL of **TIMOPTIC-XE 0.25%** contains 2.5 mg of timolol (3.4 mg of timolol maleate). Each mL of **TIMOPTIC-XE 0.5%** contains 5.0 mg of timolol (6.8 mg of timolol maleate). Inactive ingredients: GELRITE* gellan gum, tromethamine, mannitol, and water for injection. Preservative: benzododecinium bromide 0.012%.

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TIMOPTIC-XE, when applied topically on the eye, has the action of reducing elevated, as well as normal intraocular pressure, whether or not accompanied by glaucoma. Elevated intraocular pressure is a major risk factor in the pathogenesis of glaucomatous visual field loss and optic nerve damage.

The precise mechanism of the ocular hypotensive action of **TIMOPTIC-XE** is not clearly established at this time. Tonography and fluorophotometry studies of **TIMOPTIC*** (timolol maleate ophthalmic solution) in man suggest that its predominant action may be related to reduced aqueous formation. However, in some studies, a slight increase in outflow facility was also observed.

Beta-adrenergic receptor blockade reduces cardiac output in both healthy subjects and patients with heart disease. In patients with severe impairment of myocardial function, beta-adrenergic receptor blockade may inhibit the stimulatory effect of the sympathetic nervous system necessary to maintain adequate cardiac function.

Beta-adrenergic receptor blockade in the bronchi and bronchioles results in increased airway resistance from unopposed parasympathetic activity. Such an effect in patients with asthma or other bronchospastic conditions is potentially dangerous.

Pharmacokinetics

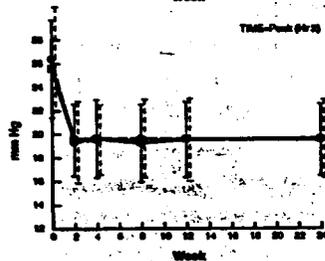
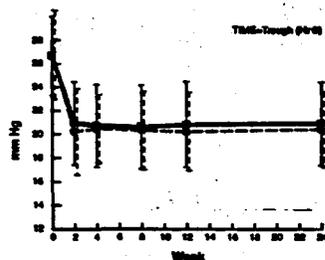
In a study of plasma drug concentration in six subjects, the systemic exposure to timolol was determined following once daily administration of **TIMOPTIC-XE 0.5%** in the morning. The mean peak plasma concentration following this morning dose was 0.28 ng/mL.

Clinical Studies

In controlled, double-masked, multicenter clinical studies, comparing **TIMOPTIC-XE 0.25%** to **TIMOPTIC 0.25%** and **TIMOPTIC-XE 0.5%** to **TIMOPTIC 0.5%**, **TIMOPTIC-XE** administered once a day was shown to be equally effective in lowering intraocular pressure (as the equivalent concentration of **TIMOPTIC** administered twice a day). The effect of timolol in

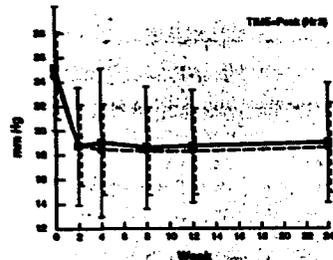
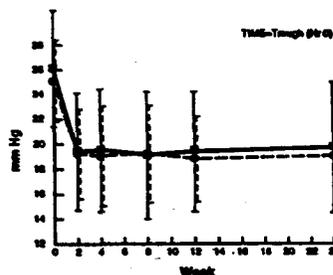
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—●— TIMOPTIC 0.5% b.l.d. N=85



International Study

—●— TIMOPTIC-XE 0.5% q.d. N=225
 —○— TIMOPTIC 0.5% b.l.d. N=116



TIMOPTIC-XE administered once daily had a safety profile similar to that of an equivalent concentration of **TIMOPTIC** administered twice daily. Due to the physical characteristics of the formulation, there was a higher incidence of transient blurred vision in patients administered **TIMOPTIC-XE**. A slight reduction in resting heart rate was observed in some patients receiving **TIMOPTIC-XE 0.5%** (mean reduction 24 hours post-dose 0.8 beats/minute, mean reduction 2 hours post-dose 3.8 beats/minute). (See ADVERSE REACTIONS.)

TIMOPTIC-XE has not been studied in patients wearing contact lenses.

INDICATIONS AND USAGE

TIMOPTIC-XE Sterile Ophthalmic Gel Forming Solution is indicated in the treatment of elevated intraocular pressure in patients with ocular hypertension or open-angle glaucoma.

CONTRAINDICATIONS

TIMOPTIC-XE is contraindicated in patients with (1) bronchial asthma; (2) a history of bronchial asthma; (3) severe chronic obstructive pulmonary disease (see WARNINGS); (4) sinus bradycardia; (5) second or third degree atrioventricular block; (6) overt cardiac failure (see WARNINGS); (7) cardiogenic shock; or (8) hypersensitivity to any component of this product.

WARNINGS

As with many topically applied ophthalmic drugs, this drug is absorbed systemically.

TIMOPTIC-XE®
(Timolol Maleate Ophthalmic Gel Forming Solution)

The same adverse reactions found with systemic administration of beta-adrenergic blocking agents may occur with topical ophthalmic administration. For example, severe respiratory reactions and cardiac reactions, including death due to bronchospasm in patients with asthma, and rarely death in association with cardiac failure, have been reported following systemic or ophthalmic administration of timolol maleate. (See CONTRAINDICATIONS.)

Cardiac Failure

Sympathetic stimulation may be essential for support of the circulation in individuals with diminished myocardial contractility, and its inhibition by beta-adrenergic receptor blockade may precipitate more severe failure.

In Patients Without a History of Cardiac Failure, continued depression of the myocardium with beta-blocking agents over a period of time can, in some cases, lead to cardiac failure. At the first sign or symptom of cardiac failure, TIMOPTIC-XE should be discontinued.

Obstructive Pulmonary Disease

Patients with chronic obstructive pulmonary disease (e.g., chronic bronchitis, emphysema) of mild or moderate severity, bronchospastic disease, or a history of bronchospastic disease (other than bronchial asthma or a history of bronchial asthma, in which TIMOPTIC-XE is contraindicated (see CONTRAINDICATIONS)) should, in general, not receive beta-blockers, including TIMOPTIC-XE.

Major Surgery

The necessity or desirability of withdrawal of beta-adrenergic blocking agents prior to major surgery is controversial. Beta-adrenergic receptor blockade impairs the ability of the heart to respond to beta-adrenergically mediated reflex stimuli. This may augment the risk of general anesthesia in surgical procedures. Some patients receiving beta-adrenergic receptor blocking agents have experienced protracted, severe hypotension during anesthesia. Difficulty in restarting and maintaining the heartbeat has also been reported. For these reasons, in patients undergoing elective surgery, some authorities recommend gradual withdrawal of beta-adrenergic receptor blocking agents.

If necessary during surgery, the effects of beta-adrenergic blocking agents may be reversed by sufficient doses of adrenergic agonists.

Diabetes Mellitus

Beta-adrenergic blocking agents should be administered with caution in patients subject to spontaneous hypoglycemia or to diabetic patients (especially those with labile diabetes) who are receiving insulin or oral hypoglycemic agents. Beta-adrenergic receptor blocking agents may mask the signs and symptoms of acute hypoglycemia.

Thyrotoxicosis

Beta-adrenergic blocking agents may mask certain clinical signs (e.g., tachycardia) of hyperthyroidism. Patients suspected of developing thyrotoxicosis should be managed carefully to avoid abrupt withdrawal of beta-adrenergic blocking agents that might precipitate a thyroid storm.

PRECAUTIONS

General

Because of potential effects of beta-adrenergic blocking agents on blood pressure and pulse, these agents should be used with caution in patients with cerebrovascular insufficiency. If signs or symptoms suggesting reduced cerebral blood flow develop following initiation of therapy with TIMOPTIC-XE, alternative therapy should be considered.

There have been reports of bacterial keratitis associated with the use of multiple dose containers of topical ophthalmic products. These containers had been inadvertently contaminated by patients who, in most cases, had a concurrent corneal disease or a disruption of the ocular epithelial surface. (See PRECAUTIONS Information for Patients.)

Choroidal detachment after filtration procedures has been reported with the administration of aqueous suppressant therapy (e.g., timolol).

Angle-closure glaucoma: In patients with angle-closure glaucoma, the immediate objective of treatment is to reopen the angle. This may require constricting the pupil. Timolol maleate has little or no effect on the pupil. TIMOPTIC-XE should not be used alone in the treatment of angle-closure glaucoma.

Anaphylaxis: While taking beta-blockers, patients with a history of atopy or history of severe anaphylactic reactions to a variety of allergens may be more reactive to repeated accidental, diagnostic or therapeutic challenge with such allergens. Such patients may be unresponsive to the usual doses of epinephrine used to treat anaphylactic reactions.

Muscle Weakness: Beta-adrenergic blockade has been reported to produce muscle weakness consistent with certain myasthenic symptoms (e.g., diplopia, ptosis, and generalized weakness). Timolol has been reported rarely to increase muscle weakness in some patients with myasthenia gravis or myasthenic symptoms.

Information for Patients

TIMOPTIC-XE®
(TIMOLOL MALEATE OPHTHALMIC
GEL FORMING SOLUTION)

Circular Number 9028708



TIMOPTIC-XE®
(TIMOLOL MALEATE OPHTHALMIC
GEL FORMING SOLUTION)

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Circular Number 9028708

TIMOPTIC-XE®
(TIMOLOL MALEATE OPHTHALMIC
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TIMOPTIC-XE®
(TIMOLOL MALEATE OPHTHALMIC
GEL FORMING SOLUTION)

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Information for Patients

Patients should be instructed to avoid allowing the tip of the dispensing container to contact the eye or surrounding structures.

Patients should also be instructed that ocular solutions, if handled improperly or if the tip of the dispensing container contacts the eye or surrounding structures, can become contaminated by common bacteria known to cause ocular infections. Serious damage to the eye and subsequent loss of

TIMOPTIC-XE® (TIMOLOL MALEATE OPHTHALMIC GEL FORMING SOLUTION)

Circular Number 9028708



TIMOPTIC-XE® (TIMOLOL MALEATE OPHTHALMIC GEL FORMING SOLUTION)

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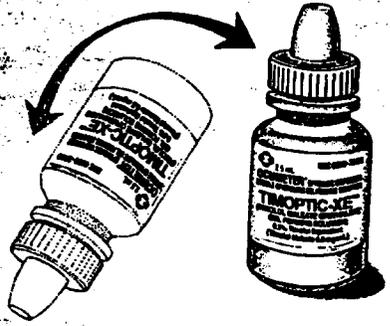
9028708

TIMOPTIC-XE®
0.25% AND 0.5%
(Timolol Maleate Ophthalmic Gel Forming Solution)

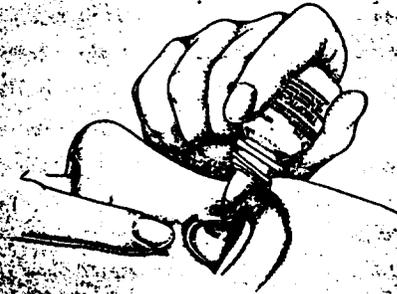
INSTRUCTIONS FOR USE

Please follow these instructions carefully when using TIMOPTIC-XE®. Use TIMOPTIC-XE as prescribed by your doctor.

1. If you use other topically applied ophthalmic medications, they should be administered at least 10 minutes before TIMOPTIC-XE.
2. Wash hands before each use.
3. Invert the closed bottle and shake ONCE before each use. (It is not necessary to shake the bottle more than once.)



4. Remove the cap from the bottle carefully so that the dispenser tip does not touch anything. Place the cap in a clean, dry area.
5. Hold the bottle between the thumb and index finger. Use the index finger of the other hand to pull down the lower eyelid to form a pocket for the eye drop. Tilt your head back.



6. Place the dispenser tip close to your eye and gently squeeze the bottle to administer one drop. Remove pressure after a single drop has been released. If instructed, repeat steps 5 and 6 in the other eye.

DO NOT ALLOW THE DISPENSER TIP TO TOUCH THE EYE OR SURROUNDING AREAS.

Ophthalmic medications, if handled improperly, can become contaminated by common bacteria known to cause eye infections. Serious damage to the eye and subsequent loss of vision may result from using contaminated ophthalmic medications. If you think your medication may be contaminated or you develop an eye infection, contact your doctor immediately concerning continued use of this bottle.

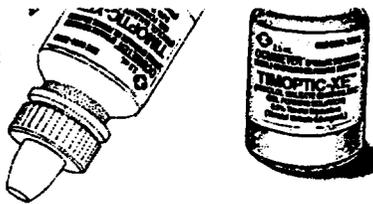
7. Replace the cap. Store the bottle at room temperature in an upright position in a clean area.
8. The dispenser tip is designed to provide a pre-measured drop; therefore, do NOT enlarge the hole of the dispenser.
9. Do NOT wash the tip of the dispenser with water, soap, or any other cleaner.



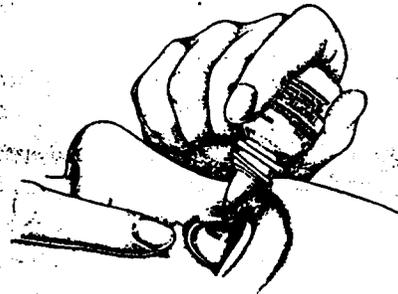
WARNING: Keep out of reach of children.

If you have any questions about the use of TIMOPTIC-XE, please consult your doctor.





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 West Point, PA 19486, USA

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 Reviewed by: [Signature] 3/2/98

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vision may result from using contaminated solutions. (See PRECAUTIONS, General.)

Patients should also be advised that if they have ocular surgery or develop an intercurrent ocular condition (e.g., trauma or infection), they should immediately seek their physician's advice concerning the continued use of the present multidose container.

Patients should be instructed to invert the closed container and shake once before each use. It is not necessary to shake the container more than once.

Patients requiring concomitant topical ophthalmic medications should be instructed to administer these at least 10 minutes before instilling TIMOPTIC-XE.

Patients with bronchial asthma, a history of bronchial asthma, severe chronic obstructive pulmonary disease, sinus bradycardia, second or third degree atrioventricular block, or cardiac failure should be advised not to take this product. (See CONTRAINDICATIONS.)

Transient blurred vision, generally lasting from 30 seconds to 5 minutes, following instillation, and potential visual disturbances may impair the ability to perform hazardous tasks such as operating machinery or driving a motor vehicle.

Drug Interactions

Beta-adrenergic blocking agents: Patients who are receiving a beta-adrenergic blocking agent orally and TIMOPTIC-XE should be observed for potential additive effects of beta-blockade, both systemic and on intraocular pressure. The concomitant use of two topical beta-adrenergic blocking agents is not recommended.

Calcium antagonists: Caution should be used in the coadministration of beta-adrenergic blocking agents, such as TIMOPTIC-XE, and oral or intravenous calcium antagonists because of possible atrioventricular conduction disturbances, left ventricular failure, or hypotension. In patients with impaired cardiac function, coadministration should be avoided.

Catecholamine-depleting drugs: Close observation of the patient is recommended when a beta blocker is administered to patients receiving catecholamine-depleting drugs such as reserpine, because of possible additive effects and the production of hypotension and/or marked bradycardia, which may result in vertigo, syncope, or postural hypotension.

Digitalis and calcium antagonists: The concomitant use of beta-adrenergic blocking agents with digitalis and calcium antagonists may have additive effects in prolonging atrioventricular conduction time.

Quinidine: Potentiated systemic beta-blockade (e.g., decreased heart rate) has been reported during combined treatment with quinidine and timolol, possibly because quinidine inhibits the metabolism of timolol via the P-450 enzyme, CYP2D6.

Injectable Epinephrine: (See PRECAUTIONS, General, Anaphylaxis.)

Carcinogenesis, Mutagenesis, Impairment of Fertility

In a two-year study of timolol maleate administered orally to rats, there was a statistically significant increase in the incidence of adrenal pheochromocytomas in male rats administered 300 mg/kg/day (approximately 42,000 times the systemic exposure following the maximum recommended human ophthalmic dose). Similar differences were not observed in rats administered oral doses equivalent to approximately 1,000 times the maximum recommended human ophthalmic dose.

In a lifetime oral study in mice, there were statistically significant increases in the incidence of benign and malignant pulmonary tumors, benign uterine polyps, and mammary adenocarcinomas in female mice at 500 mg/kg/day (approximately 7,100 times the systemic exposure following the maximum recommended human ophthalmic dose), but not at 5 or 50 mg/kg/day (approximately 700 or 7,000, respectively, times the systemic exposure following the maximum recommended human ophthalmic dose). In a subsequent study in female mice in which post-mortem examinations were limited to the uterus and the lungs, a statistically significant increase in the incidence of pulmonary tumors was again observed at 500 mg/kg/day.

The increased occurrence of mammary adenocarcinomas was associated with elevations in serum prolactin, which occurred in female mice administered oral timolol at 500 mg/kg/day, but not at oral doses of 5 or 50 mg/kg/day. An increased incidence of mammary adenocarcinomas in rodents has been associated with administration of several other therapeutic agents that elevate serum prolactin, but no correlation between serum prolactin levels and mammary tumors has been established in humans. Furthermore, in adult human female subjects who received oral dosages of up to 60 mg of timolol maleate (the maximum recommended human oral dosage), there were no clinically meaningful changes in serum prolactin.

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In a lifetime oral study in mice, there were statistically significant increases in the incidence of benign and malignant pulmonary tumors, benign uterine polyps, and mammary adenocarcinomas in female mice at 500 mg/kg/day (approximately 71,000 times the systemic exposure following the maximum recommended human ophthalmic dose), but not at 5 or 50 mg/kg/day (approximately 700 or 7,000, respectively, times the systemic exposure following the maximum recommended human ophthalmic dose). In a subsequent study in female mice in which post-mortem examinations were limited to the uterus and the lungs, a statistically significant increase in the incidence of pulmonary tumors was again observed at 500 mg/kg/day.

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Timolol maleate was devoid of mutagenic potential when tested *in vivo* (mice) in the micronucleus test and cytogenetic assay (doses up to 800 mg) and *in vitro* in a neoplastic cell transformation assay (up to 100 µg/mL). In Ames tests, the highest concentrations of timolol employed, 5,000 or 10,000 µg/plate, were associated with statistically significant elevations of revertants observed with tester strain TA 100 (in seven replicate assays) but not in the remaining three strains. In the assays with tester strain TA 100, no consistent dose response relationship was observed, and the ratio of test to control revertants did not reach 2. A ratio of 2 is usually considered the criterion for a positive Ames test.

APPROVED

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Reproduction and fertility studies in rats demonstrated no adverse effect on male or female fertility at doses up to 21,000 times the systemic exposure following the maximum recommended human ophthalmic dose.

Pregnancy — Teratogenic effects

Pregnancy Category C. Teratogenicity studies with timolol in mice, rats, and rabbits at oral doses up to 50 mg/kg/day (7,000 times the systemic exposure following the maximum recommended human ophthalmic dose) demonstrated no evidence of fetal malformations. Although delayed fetal ossification was observed at this dose in rats, there were no adverse effects on postnatal development of offspring. Doses of 1,000 mg/kg/day (142,000 times the systemic exposure following the maximum recommended human ophthalmic dose) were maternotoxic in mice and resulted in an increased number of fetal resorptions. Increased fetal resorptions were also seen in rabbits at doses of 14,000 times the systemic exposure following the maximum recommended human ophthalmic dose, in this case without apparent maternotoxicity.

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

Nursing Mothers

Timolol maleate has been detected in human milk following oral and ophthalmic drug administration. Because of the potential for serious adverse reactions from TIMOPTIC-XE in nursing infants, a decision should be made whether to discontinue nursing or to discontinue the drug, taking into account the importance of the drug to the mother.

Pediatric Use

Safety and effectiveness in pediatric patients have not been established.

Geriatric Use

Of the total number of patients in clinical studies of TIMOPTIC-XE, 46% were 65 years of age and over, while 14% were 75 years of age and over. No overall differences in effectiveness or safety were observed between these patients and younger patients, but greater sensitivity of some older individuals to the product cannot be ruled out.

ADVERSE REACTIONS

In clinical trials, transient blurred vision upon instillation of the drop was reported in approximately one in three patients (lasting from 30 seconds to 5 minutes). Less than 1% of patients discontinued from the studies due to blurred vision. The frequency of patients reporting burning and stinging upon instillation was comparable between TIMOPTIC-XE and TIMOPTIC (approximately one in eight patients).

Adverse experiences reported in 1-5% of patients were:

Ocular: Pain, conjunctivitis, discharge (e.g., crusting), foreign body sensation, itching and tearing;
Systemic: Headache, dizziness, and upper respiratory infections.

The following additional adverse experiences have been reported with the ocular administration of this or other timolol maleate formulations:

BODY AS A WHOLE

Asthenia/fatigue, and chest pain.

CARDIOVASCULAR

Bradycardia, arrhythmia, hypotension, hypertension, syncope, heart block, cerebral vascular accident, cerebral ischemia, cardiac failure, worsening of angina pectoris, palpitation, cardiac arrest, pulmonary edema, edema, claudication, Raynaud's phenomenon, and cold hands and feet.

DIGESTIVE

Nausea, diarrhea, dyspepsia, anorexia, and dry mouth.

IMMUNOLOGIC

Systemic lupus erythematosus.

NERVOUS SYSTEM/PSYCHIATRIC

Increase in signs and symptoms of myasthenia gravis, paresthesia, somnolence, insomnia, nightmares, behavioral changes and psychic disturbances including depression, confusion, hallucinations, anxiety, disorientation, nervousness, and memory loss.

SKIN

Alopecia and psoriasisiform rash or exacerbation of psoriasis.

HYPERSENSITIVITY

Signs and symptoms of allergic reactions including angioedema, urticaria, localized and generalized rash.

RESPIRATORY

Bronchospasm (predominantly in patients with pre-existing bronchospastic disease), respiratory failure, dyspnea, nasal congestion, and cough.

ENDOCRINE

Masked symptoms of hypoglycemia in diabetic patients.

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potential effects of ophthalmic timolol maleate: **Allergic:** Erythematous rash; fever combined with aching and sore throat, laryngospasm with respiratory distress; **Body as a Whole:** Extremity pain, decreased exercise tolerance, weight loss; **Cardiovascular:** Worsening of arterial insufficiency, vasodilatation; **Digestive:** Gastrointestinal pain, hepatomegaly, vomiting, mesenteric arterial thrombosis, ischemic colitis; **Hematologic:** Nonthrombocytopenic purpura, thrombocytopenic purpura, agranulocytosis; **Endocrine:** Hyperglycemia, hypoglycemia; **Skin:** Pruritus, skin irritation, increased pigmentation, sweating; **Musculoskeletal:** Arthralgia; **Nervous System/Psychiatric:** Vertigo, local weakness, diminished concentration, reversible mental depression progressing to catatonia, an acute reversible syndrome characterized by disorientation for time and place, emotional lability, slightly clouded sensorium, and decreased performance on neuropsychometrics; **Respiratory:** Hales, bronchial obstruction; **Urogenital:** Urination difficulties.

OVERDOSAGE

No data are available in regard to human overdosage with or accidental oral ingestion of TIMOPTIC-XE.

There have been reports of inadvertent overdosage with TIMOPTIC Ophthalmic Solution resulting in systemic effects similar to those seen with systemic beta-adrenergic blocking agents such as dizziness, headache, shortness of breath, bradycardia, bronchospasm, and cardiac arrest (see also ADVERSE REACTIONS).

Overdosage has been reported with tablets BLOCADREN (timolol maleate). A 30 year old female ingested 650 mg of BLOCADREN (maximum recommended oral daily dose is 60 mg) and experienced second and third degree heart block. She recovered without treatment but approximately two months later developed irregular heartbeat, hypertension, dizziness, tinnitus, faintness, increased pulse rate, and borderline first degree heart block.

Significant lethality was observed in female rats and female mice after a single oral dose of 900 and 1190 mg/kg (5310 and 3570 mg/m²) of timolol, respectively.

An *in vitro* hemodialysis study, using ¹⁴C timolol added to human plasma or whole blood, showed that timolol was readily dialyzed from these fluids; however, a study of patients with renal failure showed that timolol did not dialyze readily.

DOSAGE AND ADMINISTRATION

Patients should be instructed to invert the closed container and shake once before each use. It is not necessary to shake the container more than once. Other topically applied ophthalmic medications should be administered at least 10 minutes before TIMOPTIC-XE. (See PRECAUTIONS, Information for Patients and accompanying INSTRUCTIONS FOR USE.)

TIMOPTIC-XE Sterile Ophthalmic Gel Forming Solution is available in concentrations of 0.25% and 0.5%. The dose is one drop of TIMOPTIC-XE (either 0.25% or 0.5%) in the affected eye(s) once a day.

Because in some patients the pressure-lowering response to TIMOPTIC-XE may require a few weeks to stabilize, evaluation should include a determination of intraocular pressure after approximately 4 weeks of treatment with TIMOPTIC-XE.

Dosages higher than one drop of 0.5% TIMOPTIC-XE once a day have not been studied. If the patient's intraocular pressure is still not at a satisfactory level on this regimen, concomitant therapy can be considered. The concomitant use of two topical beta-adrenergic blocking agents is not recommended. (See PRECAUTIONS, Drug Interactions, Beta-adrenergic blocking agents.)

When patients have been switched from therapy with TIMOPTIC administered twice daily to TIMOPTIC-XE administered once daily, the ocular hypotensive effect has remained consistent.

HOW SUPPLIED

TIMOPTIC-XE Sterile Ophthalmic Gel Forming Solution is a colorless to nearly colorless, slightly opalescent, and slightly viscous solution.

No. 3557 — TIMOPTIC-XE Sterile Ophthalmic Gel Forming Solution, 0.25% timolol equivalent, is supplied in OCUMETER, a white, opaque, plastic, ophthalmic dispenser with a controlled drop tip as follows:

NDC 0006-3557-32, 2.5 mL

(6505-01-388-0967, 0.25% 2.5 mL)

NDC 0006-3557-03, 5 mL

(6505-01-387-9495, 0.25% 5 mL)

No. 3558 — TIMOPTIC-XE Sterile Ophthalmic Gel Forming Solution, 0.5% timolol equivalent, is supplied in OCUMETER, a white, opaque, plastic, ophthalmic dispenser with a controlled drop tip as follows:

NDC 0006-3558-32, 2.5 mL

(6505-01-388-0964, 0.5% 2.5 mL)