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## DATA SHEET

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### NAME OF MEDICINE

COMBIGAN<sup>®</sup> (brimonidine tartrate) 2.0 mg/mL and (timolol) 5.0 mg/mL eye drops

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### Presentation

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COMBIGAN<sup>®</sup> is a combination eye drop containing brimonidine tartrate and timolol. Brimonidine tartrate is an alpha-2 selective adrenergic agonist for ophthalmic use and is an off-white, pale yellow to pale pink powder that is water soluble. In solution, brimonidine tartrate has a clear, greenish-yellow colour. Timolol maleate is a non-selective beta-adrenergic receptor blocking agent. It is a white to off-white crystalline powder which is soluble in water, alcohol and practically insoluble in ether.

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### Uses

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#### **Actions**

Pharmacotherapeutic group: Antiglaucoma preparations and miotics; other antiglaucoma preparations.

COMBIGAN<sup>®</sup> consists of two active substances: brimonidine tartrate and timolol maleate. These two components decrease elevated intraocular pressure (IOP) by complementary mechanisms of action and the combined effect results in additional IOP reduction compared to either compound administered alone. COMBIGAN<sup>®</sup> has a rapid onset of action with peak effect at 2 hours post dosing.

#### Brimonidine tartrate

Brimonidine tartrate is an alpha-2 adrenergic agonist that is approximately 1000-fold more selective for the alpha-2 adrenoreceptor than the alpha-1<sup>adrenergic</sup> receptor. Affinity at human alpha-1 and alpha-2 adrenoreceptors are ~2000 nM and ~2 nM, respectively. This selectivity results in no mydriasis and the absence of vasoconstriction in microvessels associated with human retinal xenografts.

Topical administration of brimonidine solution decreases intraocular pressure (IOP) in humans. When used as directed, brimonidine eye drops have the action of reducing elevated IOP with minimal effect on cardiovascular parameters.

Brimonidine has a rapid onset of action, with the peak ocular hypotensive effect occurring at two hours post-dosing. The duration of effect is 12 hours or greater.

Fluorophotometric studies in animals and humans suggest that brimonidine solution has a dual mechanism of action. Brimonidine lowers IOP by reducing aqueous humor production and enhancing uveoscleral outflow.

#### Timolol

Timolol maleate is a nonselective beta-adrenergic receptor blocking agent that does not have significant intrinsic sympathomimetic, direct myocardial depressant or local anaesthetic (membrane stabilising) activity. Timolol maleate combines reversibly with a part of the cell membrane, the beta-adrenergic receptor, and thus inhibits the usual biological response that

would occur with stimulation of that receptor. The specific competitive antagonism blocks stimulation of the beta-adrenergic receptors by catecholamines having beta-adrenergic stimulating (agonist) activity, whether these originate from an endogenous or exogenous source. Reversal of this blockade can be accomplished by increasing the concentration of the agonist, which will restore the usual biological response.

The precise mechanism of action of timolol maleate in lowering intraocular pressure is not clearly established at this time, although a fluorescein study and tonography studies indicate that its predominant action may be related to reduced aqueous formation. However, in some studies a slight increase in outflow facility was also observed.

## ***Pharmacokinetics***

### Combigan®

Plasma brimonidine and timolol concentrations were determined in a crossover study comparing the monotherapy treatments to COMBIGAN® treatment in healthy subjects. There were no statistically significant differences in brimonidine or timolol AUC between COMBIGAN® and the respective monotherapy treatments. Mean plasma  $C_{max}$  values for brimonidine and timolol following dosing with COMBIGAN® were 0.0327 and 0.406 ng/mL respectively.

Studies in healthy subjects and patients revealed that compared to monotherapy with brimonidine and timolol, there was a tendency for reduced systemic exposure to both brimonidine and timolol following treatment with COMBIGAN®. The absorption of timolol was delayed following combination treatment compared to monotherapy (2.4 vs 1.4 hours). Following treatment with combination eye drops, the systemic concentrations of brimonidine and timolol were significantly higher in females and elderly patients.

### Brimonidine tartrate

After ocular administration of a 0.2% solution twice daily in normal healthy subjects for 10 days, plasma concentrations were measured as (mean)  $C_{max}$  0.06 ng/mL. Plasma concentrations peaked within 1 to 4 hours and declined with a systemic half-life of approximately 3 hours.

Brimonidine is metabolized primarily by the liver. Urinary excretion is the major route of elimination of the drug and its metabolites. Approximately 87% of the radioactivity following an orally-administered radioactive dose was eliminated within 120 hours, with 74% found in the urine.

### Timolol

After ocular administration of a 0.25% eye drop to humans, peak timolol concentration in the aqueous humor was 1.56 µg/mL at 1 hour post dose. The half-life of timolol in plasma is about 7 hours. Timolol is partially metabolised by the liver with timolol and its metabolites excreted by the kidney. Timolol is not extensively bound to plasma.

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## **Indications**

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COMBIGAN® eye drops are indicated for the reduction of elevated intraocular pressure in patients with open angle glaucoma or ocular hypertension not adequately responding to monotherapy.

## Clinical Studies

Elevated IOP presents a major risk factor in glaucomatous field loss. The higher the level of IOP, the greater the likelihood of optic nerve damage and visual field loss. Brimonidine has the action of lowering intraocular pressure with minimal effect on cardiovascular and pulmonary parameters.

The efficacy of COMBIGAN<sup>®</sup> was demonstrated in 4 multicentre, randomised, double-masked parallel group studies.

Study 1 compared twice daily COMBIGAN<sup>®</sup> eye drops to twice daily TIMOPTOL<sup>®</sup> (timolol 0.5%) or twice daily ALPHAGAN<sup>®</sup> (brimonidine tartrate 0.2%). A total of 589 patients were enrolled.

Study 2 compared twice daily COMBIGAN<sup>®</sup> eye drops to twice daily TIMOPTOL<sup>®</sup> (timolol 0.5%) and twice daily ALPHAGAN<sup>®</sup> (brimonidine tartrate 0.2%) administered adjunctively. A total of 371 patients were enrolled.

**Table 1: Mean IOP (mmHg) at Baseline and Mean Change from Baseline at each Scheduled Visit (ITT and LOCF) for Study 1 and Study 2**

Timepoint		Study 1			Study 2	
		COMBIGAN <sup>®</sup> ( <b>BID</b> ) ( <b>N=196</b> )	Brimonidine tartrate ( <b>BID</b> ) ( <b>N = 202</b> )	Timolol ( <b>BID</b> ) ( <b>N = 191</b> )	COMBIGAN <sup>®</sup> ( <b>BID</b> ) ( <b>N = 188</b> )	Adjunctive ( <b>BID</b> ) ( <b>N = 183</b> )
Baseline	Hour 0	24.8	24.5 (-0.10, 0.81)	24.8 (-0.49, 0.44)	25.0	25.0 (-0.41, 0.68)
	Hour 2	22.2	21.7 (-0.13, 1.03)	21.7 (-0.12, 1.05)	22.6	22.4 (-0.31, 0.81)
Week 12	Hour 0	-4.3	-2.7 <sup>a</sup> (-2.18, -0.79)	-3.9 (-1.06, 0.34)	-4.9	-4.9 (-0.60, 0.79)
	Hour 2	-5.0	-4.0 <sup>a</sup> (-1.64, -0.13)	-3.0 <sup>b</sup> (-2.73, -1.19)	-5.3	-5.3 (-0.66, 0.61)

<sup>a</sup> p < 0.05 for COMBIGAN<sup>®</sup> vs brimonidine tartrate

<sup>b</sup> p < 0.05 for COMBIGAN<sup>®</sup> vs timolol

(95% CI)

In Study 1, there were no statistically significant differences in the mean values of Hour 0 and Hour 2 at baseline between the 3 groups. The mean decreases from baseline IOP were statistically significant within each treatment group at each follow-up timepoint (p < 0.001). The mean decrease from baseline IOP was statistically significantly greater with COMBIGAN<sup>®</sup> than with brimonidine tartrate at Hour 0 and 2 at all follow-up visits (p ≤ 0.022). At the primary timepoint of Hour 0, Week 12, a difference of 1.49 mmHg from baseline IOP favouring COMBIGAN<sup>®</sup> over brimonidine tartrate was seen. This can be considered to be a clinically significant difference. There was no statistically significant difference in the mean decrease from baseline IOP between COMBIGAN<sup>®</sup> and timolol at Hour 0 at any follow-up visit (p ≥ 0.055), however the mean decreases from baseline IOP for COMBIGAN<sup>®</sup> were always numerically superior at Hour 0 at all visits.

The mean decrease from baseline IOP was statistically significantly greater with COMBIGAN<sup>®</sup> than with timolol at hour 2 at all follow-up visits (p < 0.001). Clinically significant differences of at least 1.5 mmHg in mean change from baseline IOP favouring COMBIGAN<sup>®</sup> over timolol were seen at hour 2 at all follow-up visits.

In Study 2, the mean values of Hour 0 and Hour 2 at baseline were similar between the 2 groups, with no significant differences. Mean changes from baseline IOP at Weeks 2, 6 and 12 ranged from -4.4 to -5.3 mmHg in both treatment groups. At Week 12 the mean change from baseline in Hour 0 IOP (primary efficacy endpoint) was -4.9 mmHg for both groups. The upper limit of the 95% CI for the difference in the COMBIGAN<sup>®</sup> minus the adjunctive groups was below 1.5 mmHg, the criterion for non-inferiority, demonstrating that the COMBIGAN<sup>®</sup> group was non-inferior to the adjunctive group. The mean decreases from baseline IOP at both Hour 0 and Hour 2 were also statistically significant at all follow-up visits within each treatment group (p<0.001). Thus, non-inferiority of the COMBIGAN<sup>®</sup> group compared with the adjunctive group was demonstrated at all timepoints.

Studies 3 and 4 compared twice daily COMBIGAN<sup>®</sup> with that of twice daily TIMOPTOL<sup>®</sup> (timolol 0.5%) or ALPHAGAN<sup>®</sup> (brimonidine tartrate 0.2%) three times daily administered for 12 months in patients with glaucoma or ocular hypertension. A total of 1159 patients were enrolled.

**Table 2: Mean IOP (mmHg) at Baseline and Mean Change from Baseline at each Scheduled Visit (ITT and LOCF) for Study 3 and Study 4**

		Study 3			Study 4		
Timepoint		COMBIGAN <sup>®</sup> (BID) (N = 192)	Brimonidine tartrate (TID) (N = 186)	Timolol (BID) (N = 195)	COMBIGAN <sup>®</sup> (BID) (N = 193)	Brimonidine tartrate (TID) (N = 196)	Timolol (BID) (N = 197)
Baseline	Hour 0	24.5	24.7 (-0.73, 0.31)	25.1 <sup>a</sup> (-1.08, -0.05)	24.9	25.0 (-0.64, 0.42)	24.8 (-0.42, 0.63)
	Hour 2	22.8	23.2 (-1.03, 0.19)	23.5 <sup>a</sup> (-1.22, -0.01)	23.7	23.7 (-0.56, 0.62)	23.6 (-0.44, 0.74)
	Hour 7	21.6	22.0 (-1.04, 0.29)	22.6 <sup>a</sup> (-1.56, -0.24)	22.6	23.0 (-1.07, 0.14)	22.4 (-0.47, 0.75)
	Hour 9	21.4	21.9 (-1.17, 0.15)	22.5 <sup>a</sup> (-1.68, -0.37)	22.2	22.5 (-0.98, 0.25)	22.3 (-0.77, 0.45)
Month 12	Hour 0	-6.0	-3.4 <sup>b</sup> (-3.32, -1.91)	-5.2 <sup>c</sup> (-1.72, -0.37)	-6.1	-3.2 <sup>a</sup> (-3.59, -2.17)	-5.5 (-1.31, 0.10)
	Hour 2	-6.9	-5.0 <sup>b</sup> (-2.57, -1.19)	-4.8 <sup>c</sup> (-3.00, -1.73)	-7.5	-5.0 <sup>a</sup> (-3.12, -1.73)	-5.3 <sup>b</sup> (-2.88, -1.49)
	Hour 7	-4.7	-2.2 <sup>b</sup> (-3.21, -1.75)	-3.8 <sup>c</sup> (-2.07, -0.81)	-5.1	-3.2 <sup>a</sup> (-2.54, -1.30)	-4.1 <sup>b</sup> (-1.67, -0.43)
	Hour 9	-4.1	-4.4 (-0.36, 0.98)	-3.6 <sup>c</sup> (-1.62, -0.44)	-4.7	-4.1 (-1.23, 0.07)	-4.1 (-1.22, 0.08)

<sup>a</sup> = Combination mean IOP at baseline statistically significantly lower than timolol (p ≤ 0.046)

<sup>b</sup> = Combination mean decrease in IOP from baseline statistically significantly greater than brimonidine tartrate (p < 0.001)

<sup>c</sup> = Combination mean decrease in IOP from baseline statistically significantly greater than timolol (p ≤ 0.026).

(95% CI)

In Study 3, the mean decrease from baseline diurnal IOP was statistically significantly greater with COMBIGAN<sup>®</sup> than with brimonidine tartrate at Hours 0, 2, and 7 at all follow-up visits (p < 0.001). In addition, clinically significant differences of more than 1.5 mmHg in mean change from baseline IOP favouring COMBIGAN<sup>®</sup> over brimonidine tartrate were seen at Hours 0, 2 and 7 at all follow-up visits. There was no statistically significant difference in the mean decrease from baseline IOP between COMBIGAN<sup>®</sup> and brimonidine tartrate at Hour 9 at any follow-up visit (p ≥ 0.339).

The mean decrease from baseline diurnal IOP was statistically significantly greater with COMBIGAN<sup>®</sup> than with timolol at Hours 0, 2, 7 and 9 at all follow-up visits ( $p \leq 0.026$ ). In addition, clinically significant differences of more than 1.5 mmHg in mean change from baseline IOP favouring COMBIGAN<sup>®</sup> over timolol were seen at Hours 0, 2, 7 and 9 (Week 2, Months 6 and 12), at Hours 0, 2 and 7 (Month 3), at Hours 2 and 7 (Week 6) and at Hour 2 (Month 9).

In Study 4, the mean decrease from baseline diurnal IOP was statistically significantly greater with COMBIGAN<sup>®</sup> than with brimonidine tartrate at Hours 0, 2 and 7 at all follow-up visits (except Month 9, Hour 7, when IOP was not measured) ( $p < 0.001$ ). In addition, clinically significant differences of more than 1.5 mmHg in mean change from baseline IOP favouring COMBIGAN<sup>®</sup> over brimonidine tartrate were seen at Hours 0, 2 and 7 at all follow-up visits. There was no statistically significant difference in the mean decrease from baseline IOP between COMBIGAN<sup>®</sup> and brimonidine tartrate at Hour 9 at any follow-up visit ( $p \geq 0.082$ ).

The mean decrease from baseline diurnal IOP was statistically significantly greater with COMBIGAN<sup>®</sup> than with timolol at hours 0, 2 and 7 at all follow-up visits (except Hour 0 at Month 12) and at Hour 9 at Week 2, Week 6 and month 3 ( $p \leq 0.046$ ). In addition, clinically significant differences of more than 1.5 mmHg in mean change from baseline favouring COMBIGAN<sup>®</sup> over timolol were seen at Hours 0, 2 and 7 (Week 2); at Hours 2 and 7 (Week 6, Months 6 and 12) and at Hour 2 (Months 3 and 9).

Over 12 weeks of study treatments, approximately 10% of patients on combination treatment reached and maintained an IOP of  $\leq 18$  mmHg, compared to 5.4% with brimonidine alone ( $p=0.077$  vs combination) and 9.4% with timolol alone ( $p=0.779$ ). Similarly, the number of patients achieving target IOP of  $\leq 18$  mmHg was similar in the combination and adjunctive treatment groups (6.9% and 9.3% with combination and adjunctive treatments, respectively,  $p=0.402$ ). However, over 12 months of treatment, the number of patients achieving and maintaining target IOP ( $\leq 18$  mmHg) was significantly greater in the combination group (10%-13%) compared to the brimonidine group (1.5%) in both Study 3 and Study 4. Combination treatment was significantly superior to timolol (13.5% vs 5.6%) in Study 3 only.

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## Dosage and Administration

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The recommended dose is one drop of COMBIGAN<sup>®</sup> in the affected eye(s) twice daily, approximately 12 hours apart.

In order to minimise systemic absorption of COMBIGAN<sup>®</sup> eye drops, apply pressure to the tear duct immediately following administration of the drug.

As with all eye drops containing benzalkonium chloride as a preservative, there is potential for incompatibility with other topical ophthalmic medications. If more than one topical ophthalmic drug is to be used, other eye drops should not be used within five to ten minutes of using COMBIGAN<sup>®</sup> eye drops.

### ***Paediatric Use***

Safety and effectiveness in paediatric patients have not been established. Symptoms of bradycardia, hypotension, hypothermia, hypotonia and apnea have been reported (rarely) in neonates receiving brimonidine.

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## Contraindications

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COMBIGAN<sup>®</sup> eye drops are contraindicated in patients with hypersensitivity to any component of this medication, in patients receiving monoamine oxidase (MAO) inhibitor therapy, in patients with bronchospasm, bronchial asthma or patients with a history of bronchial asthma, or severe chronic obstructive pulmonary disease, in patients with sinus bradycardia, second or third degree atrioventricular block, overt cardiac failure or cardiogenic shock.

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## Warnings and Precautions

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### General

Like other topically applied ophthalmic agents, COMBIGAN<sup>®</sup> may be absorbed systemically. No enhancement of the systemic absorption of the individual active substances has been observed.

Due to the beta-adrenergic component, timolol, the same types of cardiovascular and pulmonary adverse reactions as seen with systemic beta-blockers may occur.

Caution should be exercised in treating patients with severe or unstable and uncontrolled cardiovascular disease. Cardiac failure should be adequately controlled before beginning therapy. Patients with a history of severe cardiac disease should be watched for signs of cardiac failure and have their pulse rates checked. Cardiac and respiratory reactions, including death due to bronchospasm in patients with asthma, and rarely, death in association with cardiac failure have been reported following administration of timolol maleate.

COMBIGAN<sup>®</sup> eye drops have not been studied in patients with hepatic or renal impairment; caution should be used in treating such patients.

COMBIGAN<sup>®</sup> eye drops should be used with caution in patients with depression, cerebral or coronary insufficiency, Raynaud's phenomenon, orthostatic hypotension or thromboangiitis obliterans.

Patients should be advised that if they develop an intercurrent ocular condition (e.g. trauma, ocular surgery or infection) or any ocular reactions, particularly conjunctivitis and lid reactions, they should immediately seek their doctor's advice concerning the continued use of the product.

Beta-blockers may also mask the signs of hyperthyroidism and cause worsening of Prinzmetal angina, severe peripheral and central circulatory disorders and hypotension.

Patients who are already receiving a beta-adrenergic blocking agent orally and who are given timolol should be observed for a potential additive effect either on the intraocular pressure or on the known systemic effects of beta-blockade. The use of two topical beta-adrenergic blocking agents is not recommended.

COMBIGAN<sup>®</sup> should not be used alone in the treatment of acute angle-closure glaucoma.

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

While taking beta-blockers, patients with a history of atopy or a history of severe anaphylactic reaction to a variety of allergens may be more reactive to repeated accidental, diagnostic or therapeutic challenge with such allergens and may be unresponsive to the usual dose of adrenaline used to treat anaphylactic reactions.

Beta-adrenergic blocking agents should be administered with caution in patients subject to spontaneous hypoglycaemia or to diabetic patients (especially those with labile diabetes) as beta-blockers may mask the signs and symptoms of acute hypoglycaemia.

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 anaesthesia in surgical procedures. In patients undergoing elective surgery, it may be necessary to gradually withdraw the 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.

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

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.

## ***Preclinical Findings***

### ***Carcinogenicity, Mutagenicity and Impairment of Fertility***

No study has been conducted to investigate the carcinogenicity, mutagenicity or effects on fertility of COMBIGAN<sup>®</sup>. The following information is based on studies with timolol maleate or brimonidine tartrate alone.

In a two-year study of timolol maleate in rats, there was a statistically significant increase in the incidence of adrenal pheochromocytomas in male rats dosed orally at 300 mg/kg/day, but not at 100 mg/kg/day (approximately 1000 times the maximum recommended ophthalmic dose in humans on a "mg/m<sup>2</sup>" basis). In a long term study in mice, there were statistically significant increases in the incidence of benign and malignant pulmonary tumours, benign uterine polyps and mammary adenocarcinomas in female mice dosed orally at 500 mg/kg/day, but not at 50 mg/kg/day (approximately 300 times the maximum recommended ophthalmic dose in humans on a "mg/m<sup>2</sup>" basis). 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 tumours was again observed at 500 mg/kg/day. The increased occurrence of mammary adenocarcinomas in female mice was associated with elevations in serum prolactin. 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 tumours has been established in humans. In adult women who received oral treatment with timolol maleate at doses up to 60 mg (the maximum recommended human oral dosage), there were no clinically meaningful changes in serum prolactin.

No compound-related carcinogenic effects of brimonidine were observed in a 21-month study in mice or a 2-year study in rats at oral doses up to 2.5 and 1 mg/kg/day (as the free base), respectively, with plasma concentrations of brimonidine at least 150 times those expected in humans dosed therapeutically.

Both *in vitro* and *in vivo* studies (Ames test, neoplastic cell transformation assay, cytogenetic assay and micronucleus test in mice) showed no genotoxicity of timolol. Negative results were also observed for brimonidine in assays for chromosomal damage (Chinese hamster cells *in vitro*, *in vivo* bone marrow cytogenetic assay and a dominant lethal assay). In gene mutation assays with *S. typhimurium* and *E. coli*, brimonidine gave a positive response in one *S. typhimurium* strain without metabolic activation, but gave negative results in other tester strains.

Reproductive toxicity studies of timolol in rats showed no adverse effects on male or female fertility at oral doses up to 100 mg/kg/day. A study of brimonidine in rats also did not reveal significant effects on fertility at oral doses of up to 0.66 mg/kg/day.

### ***Use in Pregnancy - Category C***

There are no adequate data on the use of COMBIGAN<sup>®</sup> eye drops in pregnant women.

Timolol was not teratogenic in mice, rats or rabbits at oral doses up to 50 mg/kg/day (over 300 times the maximum recommended clinical dose on a “mg/m<sup>2</sup>” basis), although delayed fetal ossification was observed at this dose in rats. At higher doses, there were increases in resorptions and fetal variations (14 ribs and hypoplastic sternebrae) in mice (1000 mg/kg/day), increased resorptions in rabbits (≥ 90 mg/kg/day), and a decreased number of caudal vertebral bodies and arches as well as an increase in hypoplastic sternebrae in rats (500 mg/kg/day).

Epidemiological studies suggest that owing to their pharmacological effects beta-blockers may reduce placental perfusion, which may result in intrauterine growth retardation, premature delivery, or fetal death. In addition, undesirable effects (e.g. bradycardia and hypoglycaemia) may occur in the fetus and the neonate. There is also an increased risk of cardiac and pulmonary complications in a neonate that has been exposed to a beta-blocker.

Brimonidine was not teratogenic in rats or rabbits. However, the drug crosses the placenta and enters fetal circulation in rats. At exposures of about 580 times that maximally anticipated in humans (based on AUC), brimonidine was associated with both maternal and embryofetal toxicity (increased early resorptions/post-implantation losses and decreased pup viability and body weights) in rats. Evidence for maternal and embryofetal toxicity (abortions) of brimonidine was also observed in rabbits at exposures about 37 times that maximally anticipated in humans.

COMBIGAN<sup>®</sup> should not be used during pregnancy unless the expected therapeutic benefit clearly outweighs the potential risk to the fetus.

### ***Use in Lactation***

It is not known whether brimonidine is excreted in human milk. In lactating rats, levels of the drug in milk were up to 12 times higher than those in maternal plasma; and in a peri- and postnatal study in rats, brimonidine was associated with decreased pup viability and pup weights during lactation at maternal plasma exposures of about 55 times greater than those expected in humans.

Timolol is excreted in human milk and there is potential for serious adverse reactions from timolol in breastfed infants.

Therefore, a decision should be made whether to discontinue breastfeeding or to discontinue COMBIGAN<sup>®</sup> eye drops, taking into account the importance of COMBIGAN<sup>®</sup> eye drops to the mother.

### ***Effects on ability to drive and use machines***

As with other similar medications, COMBIGAN<sup>®</sup> eye drops can potentially cause fatigue and/or drowsiness in some patients. Patients who engage in hazardous activities requiring mental alertness, including driving, should be cautioned of the potential for a decrease in mental alertness.

### ***Information for patients***

The preservative in COMBIGAN<sup>®</sup> eye drops, benzalkonium chloride, may be absorbed by soft contact lenses. Patients wearing soft contact lenses should be instructed to wait at least 15 minutes after using COMBIGAN<sup>®</sup> eye drops to insert soft contact lenses.

As with other similar medications, COMBIGAN<sup>®</sup> eye drops can potentially cause fatigue and/or drowsiness in some patients. Patients who engage in hazardous activities requiring mental alertness, including driving, should be cautioned of the potential for a decrease in mental alertness.

To avoid contamination of the solution, keep container tightly closed. Do not touch dropper tip to any surface. Discard contents 4 weeks after opening the bottle. Contents are sterile if seal is intact.

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## Adverse Effects

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Based on 12 month clinical trial data, the most commonly reported adverse drug reactions in the combination group were conjunctival hyperaemia (approximately 17% of patients) and burning sensation in the eye (approximately 11% of patients). The majority of cases were mild and led to discontinuation rates of only 3.4% and 0.5% respectively. The most common adverse events in the brimonidine group were conjunctival hyperaemia (approximately 23% of patients), eye pruritus (approximately 12% of patients) and allergic conjunctivitis (approximately 10% of patients), leading to discontinuation in 8.9%, 4.5%, and 7.6% respectively. The most common adverse events in the timolol group were burning sensation in the eye (approximately 13% of patients) and conjunctival hyperaemia (approximately 8% of patients), leading to discontinuation in 1% and 0.5% respectively.

In the 12 month studies, discontinuations due to adverse events occurred in 14.3% of patients in the combination group compared with 30.6% in the brimonidine group and 5.1% in the timolol group.

Over 85% of patients in each treatment group showed no change in visual acuity, defined as less than a 2-line difference from baseline. An improvement in visual acuity of 2 lines or more was reported for 0.3% of patients in the combination group, and 0.1% each in the brimonidine and timolol groups. A worsening of visual acuity of 2 lines or more was reported for 9.4% of patients in the combination group, 9.2% in the brimonidine group, and 12.2% of patients in the timolol group.

Overall, approximately 95% of patients in each treatment group showed a <5 dB change in mean deviation of the visual fields from baseline. Improvement in visual fields (increase of >5 dB) was reported for 0.9% of patients in the timolol group, 0.6% in the combination group, and 0% in the brimonidine group. Worsening of visual fields of  $\geq 5$  dB was reported for 3.4% of patients in the combination group, 4.6% of patients in the brimonidine group, and 3.4% of patients in the timolol group.

Greater than 96% of patients in each treatment group showed a minimal change (between  $>-0.2$  and  $< +0.2$ ) from baseline in Cup/Disc ratio. Worsening of  $\geq +0.2$  was reported for 2.1% of patients in the combination group, 0.8% of patients in the brimonidine group, and 2.1% of patients in the timolol group.

The following adverse drug reactions were reported during clinical trials with COMBIGAN<sup>®</sup> eye drops:

*Eye disorders:*

Very common ( $>1/10$ ): conjunctival hyperaemia, burning sensation.

Common ( $>1/100$ ,  $<1/10$ ): stinging sensation in the eye, eye pruritus, allergic conjunctivitis, conjunctival folliculosis, visual disturbance, blepharitis, epiphora, corneal erosion, superficial punctate keratitis, eye dryness, eye discharge, eye pain, eye irritation, foreign body sensation.

Uncommon (>1/1000, <1/100): visual acuity worsened, conjunctival oedema, follicular conjunctivitis, conjunctivitis, vitreous floater, asthenopia, photophobia, papillary hypertrophy, eyelid pain, abnormal vision, conjunctival blanching, corneal oedema, corneal infiltrates, vitreous detachment.

*Psychiatric disorders:*

Common (>1/100, <1/10): depression

*Nervous system disorders:*

Common (>1/100, <1/10): somnolence, headache

Uncommon (>1/1000, <1/100): dizziness, syncope

*Cardiac disorders:*

Uncommon (>1/1000, <1/100): congestive heart failure, palpitations

*Vascular disorders:*

Common (>1/100, <1/10): hypertension

*Respiratory, thoracic and mediastinal disorders:*

Uncommon (>1/1000, <1/100): rhinitis, nasal dryness

*Gastrointestinal disorders:*

Common (>1/100, <1/10): oral dryness

Uncommon (>1/1000, <1/100): taste perversion

*Skin and subcutaneous tissue disorders:*

Common (>1/100, <1/10) eyelid oedema, eyelid pruritus, eyelid erythema

Uncommon (>1/1000, <1/100): allergic contact dermatitis

*General disorders and administration site conditions:*

Common (>1/100, <1/10): asthenic conditions

*Investigations:*

Common (>1/100, <1/10): LFTs abnormal

Additional adverse events that have been seen with one of the components and may potentially occur also with COMBIGAN<sup>®</sup> eye drops are as follows:

Brimonidine tartrate

*Ocular effects:*

Blurring, ocular allergic reaction, corneal staining, conjunctival discharge and conjunctival papillae.

*Systemic effects:*

Fatigue/drowsiness, upper respiratory symptoms, gastrointestinal symptoms and systemic allergic reaction.

Timolol

*Ocular effects:*

Blepharoptosis, decreased corneal sensitivity, diplopia, ptosis and choroidal detachment following filtration surgery.

*Systemic effects:*

Bradycardia, arrhythmia, hypotension, syncope, heart block, cerebrovascular accident, cerebral ischaemia, cardiac arrest, oedema, claudication, Raynaud's phenomenon, cold hands and feet, bronchospasm, (predominantly in patients with pre-existing bronchospastic disease), exacerbation of asthma, respiratory failure, dyspnoea, cough, fatigue, chest pain, alopecia, psoriasiform rash or exacerbation of psoriasis, signs and symptoms of allergic reactions including angioedema, urticaria, localised and generalised rash, insomnia, nightmares, memory loss, increase in signs and symptoms of myasthenia gravis, paraesthesia, nausea, diarrhoea, dyspepsia, decreased libido, Peyronie's disease, systemic lupus erythematosus and tinnitus.

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## Interactions

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Although specific drug interaction studies have not been conducted with COMBIGAN<sup>®</sup> eye drops, the possibility of an additive or potentiating effect with CNS depressants (alcohol, barbiturates, opiates, sedatives, or anaesthetics) should be considered. There is potential for additive effects resulting in hypotension, and/or marked bradycardia when eye drops with timolol are administered concomitantly with oral calcium channel blockers, guanethidine, or beta-blocking agents, anti-arrhythmics, digitalis glycosides or parasympathomimetics.

Caution is advised when initiating or changing the dose of a concomitant systemic agent (irrespective of pharmaceutical form) which may interact with  $\alpha$ -adrenergic agonists or interfere with their activity i.e. agonists or antagonists of the adrenergic receptor e.g. (isoprenaline, prazosin).

The hypertensive reaction to sudden withdrawal of clonidine can be potentiated when taking beta-blockers. No data on the level of circulating catecholamines after COMBIGAN<sup>®</sup> eye drops are instilled are available. Caution, however, is advised in patients taking tricyclic antidepressants which can affect the metabolism and uptake of circulating amines.

As brimonidine tartrate is metabolised primarily by the liver, most likely by cytochrome P450 and aldehyde oxidase, COMBIGAN<sup>®</sup> eye drops may affect the metabolism of other drugs that utilise the cytochrome P450 pathway.

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 P450 enzyme, CYP2D6.

Although timolol used alone has little or no effect on pupil size, mydriasis resulting from concomitant therapy with timolol and epinephrine has been reported occasionally.

Beta-blockers may increase the hypoglycaemic effect of antidiabetic agents. Beta-blockers can mask the signs and symptoms of hypoglycaemia.

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.

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## Overdosage

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No data are available with regard to overdose with COMBIGAN<sup>®</sup> eye drops.

### Brimonidine tartrate

Ophthalmic overdose:

There is no experience in adults with the unlikely case of an overdosage via the ophthalmic route. However, symptoms of brimonidine tartrate overdose such as hypotension, bradycardia, hypothermia and apnea have been reported in a few neonates receiving brimonidine tartrate as part of medical treatment of congenital glaucoma.

Systemic overdose resulting from accidental ingestion:

Accidental human adult ingestion of brimonidine tartrate 0.2% has resulted in a hypotensive episode followed by rebound hypertension.

Oral overdoses of other alpha 2 agonists have been reported to cause symptoms such as hypotension, asthenia, vomiting, lethargy, sedation, bradycardia, arrhythmias, miosis, apnea, hypotonia, hypothermia, respiratory depression and seizure.

### Timolol

Symptoms of systemic timolol overdose are: bradycardia, hypotension, bronchospasm and cardiac arrest. A study of patients showed that timolol did not dialyse readily.

If overdose occurs treatment should be symptomatic and supportive.

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## Pharmaceutical Precautions

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To avoid contamination of the solution, keep container tightly closed. Do not touch dropper tip to any surface. Contents are sterile if seal is intact.

Shelf life: 15 months

Storage: Store below 25°C. Protect from light.

Discard contents 4 weeks after opening the bottle.

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## Medicine Classification

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Prescription Medicine

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## Package Quantities

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COMBIGAN<sup>®</sup> (brimonidine tartrate 0.2% and timolol 0.5%) ophthalmic sterile solution is supplied in white opaque plastic dropper bottles (5mL).

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## Further Information

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### *Composition*

Each mL of COMBIGAN<sup>®</sup> contains 2 mg of brimonidine tartrate and 5 mg of timolol (6.83 mg of timolol maleate).

### *List of excipients*

PRESERVATIVE: benzalkonium chloride

INACTIVES: dibasic sodium phosphate heptahydrate, monobasic sodium phosphate monohydrate, hydrochloric acid or sodium hydroxide, purified water.

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## Name and Address

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## Date of Preparation

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December 2004

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