

# Summary of Product Characteristics

## 1 NAME OF THE MEDICINAL PRODUCT

Isoptin SR 240 mg Prolonged-Release Tablets

## 2 QUALITATIVE AND QUANTITATIVE COMPOSITION

Each Isoptin SR Prolonged-Release tablet contains 240 mg Verapamil Hydrochloride.

Excipients: Each prolonged release tablet contains up to 32mg (1.39mmol) Sodium.

For a full list of excipients, see section 6.1

## 3 PHARMACEUTICAL FORM

Prolonged-release film-coated tablet

The oblong tablets are film-coated and light green colour, with a breakline on both sides and the Knoll logo on one side. The tablets can be divided into equal halves but must not be crushed or chewed.

## 4 CLINICAL PARTICULARS

### 4.1 Therapeutic Indications

Mild to moderate hypertension and coronary heart disease, i.e. prophylaxis of myocardial ischaemia, angina pectoris.

### 4.2 Posology and method of administration

The dose of verapamil hydrochloride should be adjusted individually in accordance with the severity of disease. Long-standing clinical experience shows that the average daily dose in all indications is between 240 mg and 360 mg. The daily dose should not exceed 480 mg on a long-term basis, although a higher dose may be used for a short period. There is no limitation on the duration of use. Verapamil hydrochloride should not be discontinued abruptly after long-term use. It is recommended to taper the dosage.

Verapamil hydrochloride 40mg mg tablets should be used for patients likely to display a satisfactory response to low doses (e.g., patients with hepatic dysfunction or elderly patients). For patients requiring higher dosages (e.g., 240 mg to 480 mg verapamil hydrochloride per day), formulations with a more suitable active drug content should be used.

*Adults Hypertension:* The adult dose is one tablet (240 mg) in the morning, increasing if necessary after one week to 240 mg in the morning and 240 mg in the evening, with an interval of 12 hours. In elderly patients, the initial dose is half a tablet (120 mg) in the morning, increasing by 120 mg increments at weekly intervals according to patient response.

*Angina pectoris:* The usual dose is 120-240 mg twice daily according to patient response. It is recommended that low initial doses with upward titration are used in new patients.

### Special Populations

#### **Renal impairment**

Currently available data are described in Special Warnings and Precautions for Use Section. Verapamil hydrochloride should be used cautiously and with close monitoring in patients with impaired renal function.

#### *Liver impairment*

In patients with impaired liver function, metabolism of the drug is delayed to a greater or lesser extent depending on the severity of hepatic dysfunction, thus potentiating and prolonging the effects of verapamil hydrochloride.

Therefore, the dosage needs to be adjusted with special caution in patients with impaired liver function and low doses should be given initially (see Special Warnings and Precautions for Use Section).

**Method of administration**

For oral use only.

Tablets should be taken without sucking or chewing, with sufficient liquid, preferably with or shortly after meals.

Verapamil should not be taken with grapefruit juice (see Section 4.5, Interactions).

**4.3 Contraindications**

- Hypersensitivity to verapamil hydrochloride or to any of the inactive ingredients;
- Cardiogenic shock;
- Second- or third-degree AV block (except in patients with a functioning artificial pacemaker);
- Sick sinus syndrome (except in patients with a functioning artificial pacemaker);
- Heart failure with reduced ejection fraction of less than 35%, and/or pulmonary wedge pressure above 20 mm Hg (unless secondary to a supraventricular tachycardia amenable to verapamil therapy);
- Atrial fibrillation/flutter, in the presence of an accessory bypass tract (e.g., Wolff-Parkinson-White syndrome, Lown-Ganong-Levine syndromes). These patients are at risk to develop ventricular tachyarrhythmia including ventricular fibrillation if verapamil hydrochloride is administered.
- Marked hypotension;
- Left ventricular failure;
- **within 7 days** of an acute MI;
- Combination with ivabradine (see section Interactions with other medicinal products and other forms of interaction)

**4.4 Special warnings and precautions for use****Acute Myocardial infarction**

Use with caution in acute myocardial infarction complicated by bradycardia, marked hypotension, or left ventricular dysfunction.

**Heart Block/ 1st Degree AV block/Bradycardia/Asystole**

Verapamil hydrochloride affects the AV and SA nodes and prolongs AV conduction time. Use with caution as development of second- or third-degree AV block (contraindication) or unifascicular, bifascicular or trifascicular bundle branch block requires discontinuation reduction in subsequent doses or discontinuation of verapamil hydrochloride and institution of appropriate therapy, if needed.

Verapamil hydrochloride affects the AV and SA nodes and rarely may produce second- or third-degree AV block, bradycardia, and, in extreme cases, asystole. This is more likely to occur in patients with a sick sinus syndrome (SA nodal disease), which is more common in older patients.

Asystole in patients other than those with sick sinus syndrome is usually of short duration (few seconds or less), with spontaneous return to AV nodal or normal sinus rhythm. If this does not occur promptly, appropriate treatment should be initiated immediately. See Undesirable Effects Section.

When treating hypertension, the patient's blood pressure should be monitored at regular intervals.

Care should be taken in patients with: Broad complex ventricular tachycardia, Bradycardia less than 50 beats/minute, Systolic blood pressure less than 90 mmHg, Atrial fibrillation/flutter, Simultaneous pre-excitation syndrome, e.g. Wolff-Parkinson-White syndrome (risk of inducing ventricular tachycardia). Intravenous beta-blockers should not be co-administered to patients on sustained release verapamil (except in ICU settings).

If acute cardiovascular side effects arise, treat as for overdose (see Section 4.9, Overdose).

**Antiarrhythmics, Beta-blockers**

Mutual potentiation of cardiovascular effects (higher-grade AV block, higher-grade lowering of heart rate, induction of heart failure and potentiated hypotension). Asymptomatic bradycardia (36 beats/minute) with a wandering atrial pacemaker has been observed in a patient receiving concomitant timolol (a beta-adrenergic blocker) eye drops and oral verapamil hydrochloride.

**Colchicine:**

There has been a single postmarketing report of paralysis (tetraparesis) associated with the combined use of verapamil and colchicine. This may have been caused by colchicine crossing the blood-brain barrier due to CYP3A4 and P-gp inhibition by verapamil. Combined use of verapamil and colchicine is not recommended. (see Section 4.5, Drug Interactions).

### **Digoxin**

If verapamil is administered concomitantly with digoxin, reduce digoxin dosage. See Interactions with other medicinal drug products and other forms of interaction section.

### **Heart Failure**

Heart failure patients with ejection fraction higher than 35% should be compensated before starting verapamil treatment and should be adequately treated throughout.

**HMG-CoA Reductase Inhibitors ("Statins")** – See *Interaction with other medicinal products and other forms of interaction* section

### **Neuromuscular transmission disorders**

Verapamil hydrochloride should be used with caution in the presence of diseases in which neuromuscular transmission is affected (myasthenia gravis, Lambert-Eaton syndrome, advanced Duchenne muscular dystrophy).

Respiratory standstill has been reported for one patient with progressive muscular dystrophy following administration of Isoptin.

### **Other Special Populations**

#### ***Renal impairment***

Although impaired renal function has been shown in robust comparator studies to have no effect on verapamil pharmacokinetics in patients with end-stage renal failure, several case reports suggest that verapamil should be used cautiously and with close monitoring in patients with impaired renal function.

Verapamil cannot be removed by hemodialysis.

#### ***Liver impairment***

Use with caution in patients with severely impaired liver function (see also Posology section on liver impairment).

### **Sodium**

This medicine contains 37.1 mg sodium per tablet, equivalent to 1.9 % of the WHO recommended maximum daily intake of 2 g sodium for an adult.

## **4.5 Interaction with other medicinal products and other forms of interactions**

In rare instances, including when patients with severe cardiomyopathy, congestive heart failure or recent myocardial infarction were given intravenous beta-adrenergic blocking agents or disopyramide concomitantly with intravenous verapamil hydrochloride, serious adverse effects have occurred.

Concomitant use of verapamil hydrochloride injection with agents that decrease adrenergic function may result in an exaggerated hypotensive response.

In vitro metabolic studies indicate that verapamil hydrochloride is metabolized by cytochrome P450 CYP3A4, CYP1A2, CYP2C8, CYP2C9 and CYP2C18. Verapamil has been shown to be an inhibitor of CYP3A4 enzymes and P-glycoprotein (P-gp). Clinically significant interactions have been reported with inhibitors of CYP3A4 causing elevation of plasma levels of verapamil hydrochloride while inducers of CYP3A4 have caused a lowering of plasma levels of verapamil hydrochloride, therefore, patients should be monitored for drug interactions. Coadministration of verapamil with a drug known to be primarily metabolized by CYP3A4 or known to be a P-gp substrate may be associated with elevations in drug concentrations that could increase or prolong both therapeutic and adverse effects of the concomitant drug.

With the simultaneous administration of Isoptin and drugs with a cardiodepressive action and/or inhibitory effects on impulse generation or conduction, e.g. beta-receptor blockers, antiarrhythmics and inhalation anaesthetics, watch should be kept for possible additive effects (AV blockade, bradycardia, hypotension, heart failure).

Above all, Isoptin should not be administered intravenously if the patient is on beta-receptor blockers (except in intensive care).

The blood pressure lowering effect of Isoptin must be borne in mind in patients on antihypertensive drugs.

**The following table provides a list of potential interactions with verapamil :****Potential Drug Interactions associated with Verapamil**

<b>Concomitant drug</b>	<b>Potential effect on verapamil or concomitant drug</b>	<b>Comment</b>
<b><i>Alpha blockers</i></b>		
Prazosin	↑ prazosin C <sub>max</sub> (~40%) with no effect on half-life	Additive hypotensive effect.
Terazosin	↑ terazosin AUC (~24%) and C <sub>max</sub> (~25%)	
<b><i>Antiarrhythmics</i></b>		
Flecainide	Minimal effect on flecainide plasma clearance (<~10%); no effect on verapamil plasma clearance	See section 4.4
Quinidine	↓oral quinidine clearance (~35%)	Hypotension. Pulmonary edema may occur in patients with hypertrophic obstructive cardiomyopathy.
<b><i>Antiasthmatics</i></b>		
Theophylline	↓oral and systemic clearance by ~20%	Reduction of clearance was lessened in smokers (~11%)
<b><i>Anticonvulsants/ Anti-epileptics</i></b>		
Carbamazepine	↑ carbamazepine AUC (~46%) in refractory partial epilepsy patients	Increased carbamazepine levels. This may produce carbamazepine side effects such as diplopia, headache, ataxia or dizziness.
Phenytoin	↓ verapamil plasma concentrations	
<b><i>Antidepressants</i></b>		
Imipramine	↑ imipramine AUC (~15%)	No effect on level of active metabolite, desipramine
<b><i>Antidiabetics</i></b>		
Glyburide	↑ glyburide C <sub>max</sub> (~28%), AUC (~26%)	
Metformin	Co-administration of verapamil with metformin may reduce the efficacy of metformin.	
<b><i>Anti-gout agents</i></b>		

Colchicine	Possible ↑ colchicine levels ↑ colchicine AUC (~ 2.0fold) and Cmax (~1.3-fold)	Reduce colchicine dose (see colchicine label)
<b>Anti-infectives</b>		
Clarithromycin	Possible ↑ in verapamil levels	
Erythromycin	Possible ↑ in verapamil levels	
Rifampicin	↓ verapamil AUC (~97%), Cmax (~94%), oral bioavailability (~92%) with oral verapamil administration	Blood pressure lowering effect may be reduced.
Telithromycin	Possible ↑ in verapamil levels	
<b>Antineoplastics</b>		
Doxorubicin	↑ doxorubicin AUC (104%) and Cmax (61%) with oral verapamil administration	In patients with small cell lung cancer
	No significant change in doxorubicin PK with intravenous verapamil administration	In patients with advanced neoplasms
<b>Barbiturates</b>		
Phenobarbital	↑ oral verapamil clearance (~5-fold)	
<b>Benzodiazepines and other anxiolytics</b>		
Buspirone	↑ buspirone AUC, Cmax by ~3.4-fold	
Midazolam	↑ midazolam AUC (~3fold) and Cmax (~2-fold)	
<b>Beta blockers</b>		
Metoprolol	↑ metoprolol AUC (~32.5%) and Cmax (~41%) in angina patients	See Special warnings and precautions for use section
Propranolol	↑ propranolol AUC (~65%) and Cmax (~94%) in	

	angina patients	
<b>Cardiac glycosides</b>		
Digitoxin	↓ digitoxin total body clearance (~27%) and extrarenal clearance (~29%)	
Digoxin	Healthy subjects: ↑ C <sub>max</sub> (~44%) ↑ digoxin C <sub>12h</sub> (~53%) ↑ C <sub>ss</sub> (~44%) and ↑ AUC (~50%)	Reduce digoxin dosage. Also see Special Warnings and Precautions for Use Section
<b>H2 Receptor Antagonists</b>		
Cimetidine	↑ AUC of R (~25%) and S (~40%) verapamil with corresponding ↓ in R- and S-verapamil clearance	Cimetidine reduces verapamil clearance following intravenous verapamil administration.
<b>Immunologics/ Immuno-suppressives</b>		
Ciclosporin	↑ ciclosporin AUC, C <sub>ss</sub> , C <sub>max</sub> by ~45%	
Everolimus	Everolimus: ↑ AUC (~3.5fold) and ↑ C <sub>max</sub> (~2.3fold) Verapamil: ↑ C <sub>trough</sub> (~2.3-fold)	Concentration determinations and dose adjustments of everolimus may be necessary.
Sirolimus	Sirolimus ↑ AUC (~2.2-fold); Sverapamil ↑ AUC (~1.5-fold)	Concentration determinations and dose adjustments of sirolimus may be necessary.
Tacrolimus	Possible ↑ tacrolimus levels	
<b>Lipid lowering agents (HMG COA reductase inhibitors)</b>		
Atorvastatin	Possible ↑ atorvastatin levels Increase verapamil AUC (~43%)	Additional information follows
Lovastatin	Possible ↑ lovastatin levels	

	↑ verapamil AUC (~63%) and C <sub>max</sub> (~32%)	
Simvastatin	↑ simvastatin AUC (~2.6fold), C <sub>max</sub> (~4.6fold)	
<b>Serotonin receptor agonists</b>		
Almotriptan	↑ almotriptan AUC (~20%) ↑ C <sub>max</sub> (~24%)	
<b>Uricosurics</b>		
Sulfinpyrazone	↑ verapamil oral clearance (~3-fold) ↓ bioavailability (~60%)	Blood pressure lowering effect may be reduced.
	No change in PK with intravenous verapamil administration	
<b>Anticoagulants</b>		
Dabigatran	<u>Verapamil immediate release</u> ↑ dabigatran (C <sub>max</sub> up to 180%) and AUC (up to 150%)  <u>Verapamil sustained release</u> ↑ dabigatran (C <sub>max</sub> up to 90%) and AUC (up to 70%)	The risk of bleeding may increase. The dose of dabigatran with oral verapamil may need to be reduced. (See dabigatran label for dosing instructions).
Other direct oral anticoagulants (DOACs)	Increased absorption of DOACs since they are P-gp substrates and, if applicable, also reduced elimination of DOACs which are metabolized by Cyp 3A4, may increase the systemic bioavailability of DOACs.	Some data suggest a possible increase of the risk of bleeding, especially in patients with further risk factors (see DOAC label for further information).
<b>Other Cardiac therapy</b>		
Ivabradine	Concomitant use with	See section Contraindications

	ivabradine is contraindicated due to the additional heart rate lowering effect of verapamil to ivabradine	
<b>Other</b>		
Grapefruit juice	↑ R-(~49%) and S-(~37%) verapamil AUC ↑ R-(~75%) and S-(~51%) verapamil Cmax	Elimination half-life and renal clearance not affected. Grapefruit juice should therefore not be ingested with verapamil.
St. John's Wort	↓ R-(~78%) and S-(~80%) verapamil AUC with corresponding reductions in Cmax	

### Other Drug Interactions and Additional Drug Interaction Information

#### **HIV antiviral agents:**

Due to the metabolic inhibitory potential of some of the HIV antiviral agents, such as ritonavir, plasma concentrations of verapamil may increase. Caution should be used or dose of verapamil may be decreased.

#### **Lithium:**

Increased sensitivity to the effects of lithium (neurotoxicity) has been reported during concomitant verapamil hydrochloride-lithium therapy with either no change or an increase in serum lithium levels. The addition of verapamil hydrochloride, however, has also resulted in the lowering of the serum lithium levels in patients receiving chronic stable oral lithium. Patients receiving both drugs should be monitored carefully.

#### **Neuromuscular blocking agents:**

Clinical data and animal studies suggest that verapamil hydrochloride may potentiate the activity of neuromuscular blocking agents (curare-like and depolarizing). It may be necessary to decrease the dose of verapamil hydrochloride and/or the dose of the neuromuscular blocking agent when the drugs are used concomitantly.

**Aspirin:** increased tendency to bleed

#### **Ethanol (alcohol):**

Elevation of ethanol plasma levels

#### **HMG Co-A Reductase Inhibitors ("Statins"):**

Treatment with HMG CoA reductase inhibitors (e.g. simvastatin, atorvastatin or lovastatin) in a patient taking verapamil should be started at the lowest possible dose and titrated upwards. If verapamil treatment is to be added to patients already taking an HMG CoA reductase inhibitor (e.g., simvastatin, atorvastatin or lovastatin), consider a reduction in the statin dose and retitrate against serum cholesterol concentrations.

Fluvastatin, pravastatin and rosuvastatin are not metabolized by CYP3A4 and are less likely to interact with verapamil.

#### **Antihypertensives, diuretics, vasodilators**

Potentiation of the hypotensive effect

**Protein-bound drugs:**

As verapamil hydrochloride is highly bound to plasma proteins, it should be administered with caution to patients receiving other highly protein-bound drugs.

**Inhalation anesthetics:**

When used concomitantly, inhalation anesthetics and calcium antagonists, such as verapamil hydrochloride injection, should each be titrated carefully to avoid excessive cardiovascular depression.

**4.6 Fertility, pregnancy and lactation**

## Pregnancy

*Teratogenic Effects*

There are no adequate and well-controlled study data in pregnant women.

Animal studies do not indicate direct or indirect harmful effects with respect to reproductive toxicity.

Because animal reproduction studies are not always predictive of human response, during pregnancy (especially in the first trimester) verapamil should only be used if considered essential by the physician.

Verapamil crosses the placental barrier and can be detected in umbilical vein blood at delivery.

## Lactation

Verapamil hydrochloride/metabolites are excreted in human breast milk. Limited human data from oral administration has shown that the infant relative dose of verapamil is low (0.1 – 1% of the mother's oral dose) and that verapamil use may be compatible with breastfeeding.

A risk to the newborns/infants cannot be excluded. Due to the potential for serious adverse reactions in nursing infants, verapamil should only be used during lactation if it is essential for the welfare of the mother.

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

Due to its antihypertensive effect, depending on the individual response, verapamil hydrochloride may affect the ability to react to the point of impairing the ability to drive a vehicle, operate machinery or work under hazardous conditions. This applies all the more at the start of treatment, when the dose is raised, when switching from another drug and in conjunction with alcohol. Verapamil may increase the blood levels of alcohol and slow its elimination. Therefore, the effects of alcohol may be exaggerated.

**4.8 Undesirable effects**

*The following adverse events reactions have been reported with verapamil from clinical studies, postmarketing surveillance or Phase IV clinical trials and are listed below by system organ class.*

Frequencies are defined as:

very common ( $\geq 1/10$ );

common ( $\geq 1/100$  to  $< 1/10$ );

uncommon ( $\geq 1/1,000$  to  $< 1/100$ );

rare ( $\geq 1/10,000$  to  $< 1/1,000$ );

very rare ( $< 1/10,000$ );

not known (cannot be estimated from the available data).

The most commonly reported ADRs were:

headache,

dizziness,

gastrointestinal disorders: nausea, constipation and abdominal pain,

bradycardia,

tachycardia,

palpitations,

hypotension,

flushing,

oedema peripheral,  
fatigue.

**Adverse reactions reported from clinical studies with verapamil and post-marketing surveillance activities**

<b>MedDRA System Organ Class</b>	<b>Common</b>	<b>Uncommon</b>	<b>Rare</b>	<b>Unknown</b>
<b>Immune</b> system disorders				Hypersensitivity
<b>Nervous</b> system disorders	Dizziness, Headache		Paresthesia, Tremor	Extrapyramidal disorder, paralysis (tetraparesis) <sup>1</sup> , Seizures
<b>Metabolism</b> and nutrition disorders				Hyperkalaemia
<b>Psychiatric</b> disorders			Somnolence	Nervousness
<b>Ear</b> and labyrinth disorders			Tinnitus	Vertigo
<b>Cardiac</b> disorders	Bradycardia	Palpitations, Tachycardia		Atrioventricular block (1°, 2°, 3°), Cardiac failure, Cardiac arrest, Bradyarrhythmia, Sinus arrest, Sinus bradycardia; asystole
<b>Vascular</b> disorders	Flushing, Hypotension			Vasodilation, Erythromelalgia
<b>Respiratory</b> , thoracic and mediastinal disorders				Bronchospasm, Dyspnoea
<b>Gastrointestinal</b> disorders	Constipation, Nausea	Abdominal pain	Vomiting	Abdominal discomfort, Gingival hyperplasia, Ileus
<b>Skin</b> and subcutaneous tissue disorders			Hyperhidrosis	Angioedema, Stevens-Johnson syndrome, Erythema multiforme, Alopecia, Itching, Pruritus, Purpura, Rash maculopapular, Urticaria, Rash, Erythema
<b>Musculoskeletal</b> and connective tissue disorders				Arthralgia, Muscular weakness, Myalgia
<b>Renal</b> and urinary disorders				Renal failure
<b>Reproductive system</b> and breast disorders				Erectile dysfunction, Galactorrhea, Gynecomastia
<b>General disorders</b> and administration site conditions	Oedema peripheral	Fatigue		

<b>Investigations</b>				Blood prolactin increased, Transaminases increased, Blood alkaline phosphatase increased, Hepatic enzymes increased
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<sup>1</sup>There has been a single postmarketing report of paralysis (tetraparesis) associated with the combined use of verapamil and colchicine. This may have been caused by colchicine crossing the blood-brain barrier due to CYP3A4 and P-gp inhibition by verapamil. See *Interactions with other medicinal products and other forms of interaction* section.

### Reporting of suspected adverse reactions

Reporting suspected adverse reactions after authorisation of the medicinal product is important. It allows continued monitoring of the benefit/risk balance of the medicinal product. Healthcare professionals are asked to report any suspected adverse reactions via HPRC Pharmacovigilance, Website: [www.hpra.ie](http://www.hpra.ie).

## 4.9 Overdose

### Symptoms

Hypotension, shock, loss of consciousness, 1st and 2nd degree AV block (frequently as Wenckebach's phenomenon with or without escape rhythms), total AV block with total AV dissociation, escape rhythm, asystole, sinus bradycardia, sinus arrest, hyperglycaemia, metabolic acidosis and acute respiratory distress syndrome. Fatalities have occurred as a result of overdose.

### Treatment

Treatment of overdose depends upon the type and severity of symptoms. Verapamil hydrochloride cannot be removed by haemodialysis. The specific antidote is calcium, e.g. 10-20 ml of 10% calcium gluconate solution i.v. (2.25-4.5 mmol), if necessary by repeated injection or continuous infusion (e.g. 5 mmol/hr). Gastric lavage, taking the usual precautionary measures, may be appropriate. The usual emergency measures for acute cardiovascular collapse should be applied, and followed by intensive care.

Similarly, in the case of 2nd and 3rd degree AV block, atropine, isoprenaline, orciprenaline and, if required, pacemaker therapy should be considered. Asystole should be handled by the usual measures including beta adrenergic stimulation (e.g., isoproterenol hydrochloride).

If there are signs of myocardial insufficiency, dopamine, dobutamine, cardiac glycosides or calcium gluconate (10-20 ml of a 10% solution) should be administered.

In the case of hypotension, after appropriately positioning the patient, dopamine, dobutamine or noradrenaline may be given.

Due to the potential for delayed absorption of the sustained release product, patients may require observation and hospitalization for up to 48 hours.

Fatalities have occurred as a result of overdose.

## 5 PHARMACOLOGICAL PROPERTIES

### 5.1 Pharmacodynamic properties

**Pharmacotherapeutic group: Selective calcium channel blockers with direct cardiac effects, phenylalkylamine derivatives.**

**ATC Code: C08DA01**

Verapamil hydrochloride is a white or practically white crystalline powder. It is practically odourless and has a bitter taste. It is soluble in water, freely soluble in chloroform, sparingly soluble in alcohol and practically insoluble in ether.

The chemical name of verapamil hydrochloride is benzeneacetonitrile,  $\alpha$ -[3-[[2-(3, 4dimethoxyphenyl) ethyl] methylaminol] propyl]-3, 4-dimethoxy- $\alpha$ -(1-methylethyl) hydrochloride.

It has a molecular weight of 491.07 and the molecular formula is  $C_{27}H_{38}N_{2}O_4 \cdot HCl$ .

Mechanism of action and Pharmacodynamic effects; Verapamil inhibits the transmembrane influx of calcium ions into the heart and vascular smooth muscle cells. The myocardial oxygen demand is lowered directly as a result of the effect on the energy consuming metabolic processes of the myocardial cell and indirectly due to a reduction of the afterload.

Due to its effect on coronary vascular smooth muscle, Isoptin enhances myocardial blood flow, even in post-stenotic areas, and relieves coronary spasms.

These properties contribute to the anti-ischaemic and antianginal efficacy of Isoptin in all types of coronary artery disease.

Isoptin has a marked antiarrhythmic effect, particularly in supraventricular arrhythmias. It delays impulse conduction in the AV node. Owing to this, sinus rhythm is restored and/or ventricular rate is normalised, depending on the type of arrhythmia. Normally, the rate is either not affected or only minimally lowered.

The antihypertensive effect of isoptin stems from a decrease in peripheral vascular resistance, without an increase in heart rate as a reflex response. As early as day 1 of treatment, blood pressure falls; the effect is found to persist also in long-term therapy.

## 5.2 Pharmacokinetic properties

Verapamil hydrochloride is a racemic mixture consisting of equal portions of the R-enantiomer and the S-enantiomer. Verapamil is extensively metabolized. Norverapamil is one of 12 metabolites identified in urine, has 10 to 20% of the pharmacologic activity of verapamil and accounts for 6% of excreted drug. The steady-state plasma concentrations of norverapamil and verapamil are similar. Steady state after multiple once daily dosing is reached after three to four days.

### Absorption

Greater than 90% of verapamil is rapidly absorbed from the small intestine after oral administration. Mean systemic availability of the unchanged compound after a single dose of IR verapamil is 22% and that of SR verapamil approximately 33%, owing to an extensive hepatic first-pass metabolism. Bioavailability is about two times higher with repeated administration. Peak verapamil plasma levels are reached one to two hours after IR administration, and four to five hours after SR administration. The peak plasma concentration of norverapamil is attained approximately one and five hours after IR or SR administration, respectively. The presence of food has no effect on the bioavailability of verapamil.

### Distribution

Verapamil is widely distributed throughout the body tissues, the volume of distribution ranging from 1.8–6.8 L/kg in healthy subjects. Plasma protein binding of verapamil is approximately 90%.

Metabolism Verapamil is extensively metabolized. In vitro metabolic studies indicate that verapamil is metabolized by cytochrome P450 CYP3A4, CYP1A2, CYP2C8, CYP2C9 and CYP2C18. In healthy men, orally administered verapamil hydrochloride undergoes extensive metabolism in the liver, with 12 metabolites having been identified, most in only trace amounts. The major metabolites have been identified as various N and O-dealkylated products of verapamil. Of these metabolites, only norverapamil has any appreciable pharmacological effect (approximately 20% that of the parent compound), which was observed in a study with dogs.

### Elimination

Following intravenous infusion, verapamil is eliminated bi-exponentially, with a rapid early distribution phase (half-life about four minutes) and a slower terminal elimination phase (half-life two to five hours).

Following oral administration, the elimination half-life is three to seven hours. Approximately 50% of an administered dose is eliminated renally within 24 hours, 70% within five days. Up to 16% of a dose is excreted in the feces. About 3% to 4% of renally excreted drug is excreted as unchanged drug. The total clearance of verapamil is nearly as high as the hepatic blood flow, approximately 1 L/h/kg (range: 0.7-1.3 L/h/kg).

## Populations

### Paediatric:

Limited information on the pharmacokinetics in the paediatric population is available. After intravenous dosing, the mean half-life of verapamil was 9.17 hours and the mean clearance was 30 L/h, whereas it is around 70 L/h for a 70-kg adult. Steady-state plasma concentrations appear to be somewhat lower in the paediatric population after oral dosing compared to those observed in adults.

### Geriatric:

Aging may affect the pharmacokinetics of verapamil given to hypertensive patients. Elimination half-life may be prolonged in the elderly. The antihypertensive effect of verapamil was found not to be age-related.

*Renal insufficiency:*

Impaired renal function has no effect on verapamil pharmacokinetics, as shown by comparative studies in patients with end-stage renal failure and subjects with healthy kidneys. Verapamil and norverapamil are not significantly removed by hemodialysis.

*Hepatic insufficiency:*

The half-life of verapamil is prolonged in patients with impaired liver function owing to lower oral clearance and a higher volume of distribution.

Verapamil hydrochloride, administered intravenously, has been shown to be rapidly metabolized.

### **5.3 Preclinical safety data**

Reproduction studies have been performed in rabbits and rats at oral verapamil doses up to 180 mg/m<sup>2</sup>/day and 360 mg/m<sup>2</sup>/day (compared to a maximum recommended human oral daily dose of 300 mg/m<sup>2</sup>) and have revealed no evidence of teratogenicity. In the rat, however, a dose similar to the clinical dose (360 mg/m<sup>2</sup>) was embryocidal and retarded foetal growth and development. These effects occurred in the presence of maternal toxicity (reflected by reduced food consumption and weight gain of dams). This oral dose has also been shown to cause hypotension in rats.

There are, however, no adequate and well-controlled studies in pregnant women.

The cardiovascular findings and the diffuse gingival hyperplasia seen in the chronic toxicity of verapamil hydrochloride are taken into account in section 4.8 (undesirable effects).

## **6 PHARMACEUTICAL PARTICULARS**

### **6.1 List of excipients**

Microcrystalline cellulose  
Sodium alginate  
Povidone  
Magnesium stearate  
Hypromellose  
Macrogol 400  
Macrogol 6000  
Talc  
Titanium dioxide (E171)  
Quinoline yellow and indigotine aluminium lacquer  
(quinoline yellow E104, indigo carmine E132)  
Montan glycol wax

### **6.2 Incompatibilities**

Not applicable.

### **6.3 Shelf life**

36 months.

### **6.4 Special precautions for storage**

Do not store above 25°C.

### **6.5 Nature and contents of container**

Aluminium and PVC/PVDC blister packs containing 28 tablets.

**6.6 Special precautions for disposal of a used medicinal product or waste materials derived from such medicinal product and other handling of the product**

Any unused medicinal product or waste material should be disposed of in accordance with local requirements.

**7 MARKETING AUTHORISATION HOLDER**

Mylan IRE Healthcare Limited  
Unit 35/36  
Grange Parade  
Baldoyle Industrial Estate  
Dublin 13  
Ireland

**8 MARKETING AUTHORISATION NUMBER**

PA2010/003/005

**9 DATE OF FIRST AUTHORISATION/RENEWAL OF THE AUTHORISATION**

Date of first authorisation: 07 May 1987

Date of last renewal: 07 May 2007

**10 DATE OF REVISION OF THE TEXT**

January 2021