

# Summary of Product Characteristics

## 1 NAME OF THE MEDICINAL PRODUCT

Ikorel Tablets 20 mg

## 2 QUALITATIVE AND QUANTITATIVE COMPOSITION

Each tablet contains Nicorandil 20 mg.

For a full list of excipients, see section 6.1.

## 3 PHARMACEUTICAL FORM

Tablet  
Round, off-white tablets with faceted edges, scored on one side and with the marking 'IK20' on the other side.

The scoreline is only to facilitate breaking for ease of swallowing and not to divide into equal doses.

## 4 CLINICAL PARTICULARS

### 4.1 Therapeutic Indications

Ikorel is indicated in adults for the symptomatic treatment of patients with stable angina pectoris who are inadequately controlled or have a contraindication or intolerance to first-line antianginal therapies (such as beta-blockers and/or calcium antagonists).

### 4.2 Posology and method of administration

#### Posology

The usual therapeutic range is 10mg to 20mg twice daily. The usual starting dose is 10mg twice daily (bid), in the morning and in the evening preferably. It is recommended that the dose be titrated upwards in accordance with patients' needs, response and tolerance up to a maximum of 40mg twice daily, if necessary. A lower starting dose of 5mg twice daily may be used in patients particularly prone to headache.

#### *Elderly*

There are no special dose requirements for elderly patients, but as with all medicines, use of the lowest effective dose is recommended.

#### *Patients with liver and/or renal impairment*

There are no special dosage requirements for patients with hepatic and/or renal impairment.

#### *Paediatric population*

Ikorel is not recommended in paediatric patients since its safety and efficacy have not been established in this patient group.

#### Method of administration

Ikorel is administered by oral route.

The tablets are to be swallowed in the morning and in the evening as a whole with some liquid. Administration is independent from food intake.

### 4.3 Contraindications

- Hypersensitivity to nicorandil or to any of the excipients listed in section 6.1.
- Patients with shock (including cardiogenic shock), severe hypotension, or left ventricular dysfunction with low filling pressure or cardiac decompensation.
- Use of phosphodiesterase 5 inhibitors, since this can lead to a serious drop in blood pressure (see section 4.5).
- Use of soluble guanylate cyclase stimulator(s) (such as riociguat) since it can lead to a serious fall in blood pressure (see section 4.5).
- Hypovolaemia
- Acute pulmonary oedema

## 4.4 Special warnings and precautions for use

### Ulcerations

Gastrointestinal ulcerations skin and mucosal ulcerations have been reported with nicorandil (see Section 4.8).

### Gastrointestinal ulcerations

Nicorandil induced ulceration may occur at different locations in the same patient. They are refractory to treatment and most only respond to withdrawal of nicorandil treatment. If ulceration(s) develops, nicorandil should be permanently discontinued (see section 4.8). Healthcare professionals should be aware of the importance of a timely diagnosis of nicorandil-induced ulcerations and of a rapid withdrawal of nicorandil treatment in case of occurrence of such ulcerations. Based on available information, the time between starting nicorandil use and the onset of ulceration ranges from shortly after initiating nicorandil treatment to several years after starting nicorandil.

Gastrointestinal haemorrhage secondary to gastrointestinal ulceration has been reported with nicorandil. Patients taking acetylsalicylic acid or NSAIDs (Non Steroidal Anti Inflammatory Drugs) concomitantly are at increased risk for severe complications such as gastrointestinal haemorrhage. Therefore caution is advised when concomitant use of acetylsalicylic acid or NSAIDs and nicorandil is considered (see section 4.5).

If advanced, ulcers may develop into perforation, fistula, or abscess formation. Patients with diverticular disease may be at particular risk of fistula formation or bowel perforation during nicorandil treatment.

Gastrointestinal perforations in context of concomitant use of nicorandil and corticosteroids have been reported. Therefore, caution is advised when concomitant use of corticosteroids is considered.

### Eye ulcerations

Very rare conjunctivitis, conjunctival ulcer and corneal ulcer have been reported with nicorandil. Patients should be advised of the signs and symptoms and monitored closely for corneal ulcerations. If ulceration(s) develops, nicorandil should be discontinued (see section 4.8).

Decrease of blood-pressure Caution is advised if nicorandil is used in combination with other medicinal products with blood pressure lowering effect (see section 4.5 and 4.8).

### Heart failure

Due to lack of data, caution is advised to use nicorandil in patients with heart failure class NHYA III or IV.

### Hyperkalaemia

Severe hyperkalaemia has been reported very rare with nicorandil. Nicorandil should be used with care in combination with other medical products that may increase potassium levels, especially in patients with moderate to severe renal impairment (see section 4.5 and 4.8).

### Dessicant

The tablets are sensitive to moisture; hence the patients should be advised to keep the tablets in their blister until intake. Besides the nicorandil tablets, each blister contains active substance-free silica gel tablets as desiccant in a separate blister segment which is marked accordingly. The patients should be advised not to take these tablets. Although any accidental intake of this desiccant is usually harmless, it may alter the scheduled intake of the active tablets.

Paediatric population

Ikorel is not recommended in paediatric patients since its safety and efficacy have not been established in this patient group.

G6PD deficiency

Ikorel should be used with caution in patients with glucose-6-phosphate-dehydrogenase deficiency. Nicorandil acts in parts through its organic nitrate moiety. The metabolism of organic nitrates can result in the formation of nitrites which may trigger methemoglobinemia in patients with glucose-6-phosphate dehydrogenase deficiency.

**4.5 Interaction with other medicinal products and other forms of interaction**

Concurrent use of nicorandil and phosphodiesterase 5 inhibitors, e.g. sildenafil, tadalafil, vardenafil, is contraindicated, since it can lead to a serious drop in blood pressure (synergic effect).

Concomitant use of soluble guanylate cyclase stimulator (such as riociguat) is contraindicated, since it can lead to a serious drop in blood pressure.

Therapeutic doses of nicorandil may lower the blood pressure.

If nicorandil is used concomitantly with antihypertensive agents or other medicinal products with blood pressure lowering effect (e.g. vasodilators, tricyclic antidepressants, alcohol), the blood pressure lowering effect may be increased.

Dapoxetine should be prescribed with caution in patients taking nicorandil due to possible reduced orthostatic tolerance.

Gastrointestinal perforation in the context of concomitant use of nicorandil and corticosteroids has been reported. Caution is advised when concomitant use is considered.

In patients concomitantly receiving NSAIDs including acetylsalicylic acid for both cardiovascular prevention and anti-inflammatory doses, there is an increased risk for severe complications such as gastrointestinal ulceration, perforation and hemorrhage (see section 4.4).

Caution is advised when nicorandil is used in combination with other medical products that may increase potassium levels (see sections 4.4 and 4.8).

The metabolism of nicorandil is not significantly affected by cimetidine (a CYP inhibitor), or rifampicin (a CYP3A4 inducer). Nicorandil does not affect the pharmacodynamics of acenocoumarol.

**4.6 Fertility, pregnancy and lactation***Pregnancy*

There are no or limited amount of data from the use of nicorandil in pregnant women.

Animal studies do not indicate direct or indirect harmful effects with respect to reproductive toxicity (see section 5.3).

As a precautionary measure, it is preferable to avoid the use of Ikorel during pregnancy.

*Breastfeeding*

Animal studies have shown that nicorandil is excreted in small amounts into the breast milk. It is not known whether nicorandil is excreted in human milk, therefore Ikorel is not recommended during breastfeeding.

*Fertility*

There are insufficient data on fertility to estimate the risk for humans (see section 5.3).

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

Ikorel has an influence on the ability to drive and use machines. Indeed, as with other vasodilators, blood pressure-

lowering effects as well as dizziness and feeling weakness induced by nicorandil can reduce the ability to drive or to use machines. This effect can be increased in conjunction with alcohol or other medicinal products with blood pressure lowering effect (e.g. vasodilators, tricyclic antidepressants) (see section 4.5). Therefore, patients should be advised not to drive or use machines if these symptoms occur.

4.8 Undesirable effects

Summary of the safety profile

The most common adverse reaction reported in clinical trials is headache occurring in more than 30% of patients, particularly in the first days of treatment and responsible of most of study withdrawal. Progressive dose titration may reduce the frequency of these headaches (see section 4.2).

In addition, serious adverse reactions including ulcerations and their complications (see section 4.4) were reported during the post marketing surveillance of nicorandil.

Tabulated list of adverse reactions

The frequencies of adverse reactions reported with nicorandil are summarised in the following table by system organ class (in MedDRA) and by frequency. Frequencies are defined as: Very common ( $\geq 1/10$ ), Common ( $\geq 1/100$ ,  $< 1/10$ ), Uncommon ( $\geq 1/1,000$ ,  $< 1/100$ ), Rare ( $\geq 1/10,000$ ,  $< 1/1,000$ ), Very rare ( $< 1/10,000$ ), Not known (cannot be estimated from the available data). Within each frequency grouping, adverse reactions are presented in order of decreasing seriousness.

	Very common	Common	Uncommon	Rare	Very rare	Not known
Metabolism and nutrition disorders					Hyperkalaemia (see section 4.4 and 4.5)	
Nervous system disorders	Headache	Dizziness				
Eye disorders					Corneal ulcer, conjunctival ulcer, conjunctivitis (see section 4.4)	Diplopia
Cardiac disorders		Heart rate increased				
Vascular disorders		Cutaneous vasodilation with flushing	Decrease in blood pressure (see section 4.4)			
Gastrointestinal disorders		Vomiting, nausea		Gastrointestinal ulcerations (stomatitis, aphthosis, mouth ulcer, tongue ulcer, small intestinal ulcer, large intestinal ulcer, anal ulcer) (see below and section 4.4)		Gastrointestinal haemorrhage (see section 4.4)
Hepatobiliary disorders					Liver disorders such as hepatitis,	

					cholestasis, or jaundice	
<b>Skin and subcutaneous tissue disorders</b>				Rash, pruritus	Angioedema, Skin and mucosal ulcerations (mainly peri-anal ulcerations, genital ulcerations and parastomal ulcerations) (see section 4.4)	
<b>Musculoskeletal and connective tissue disorders</b>				Myalgia		
<b>General disorders and administration site conditions</b>		Feeling of weakness				

Description of selected adverse reactions

*Gastrointestinal ulcerations*

Complications of gastrointestinal ulceration such as perforation, fistula, or abscess formation sometimes leading to gastrointestinal haemorrhage and weight loss have been reported (see section 4.4).

Additional information

In addition, the following adverse reactions have been reported with different frequencies in the IONA (Impact of Nicorandil in Angina) study, where nicorandil has been used on top of standard therapy in patients with stable angina and at high risk of cardiovascular events (see section 5.1).

	<b>Common</b>	<b>Uncommon</b>	<b>Very rare</b>
<b>Gastrointestinal disorders</b>	Rectal bleeding	Mouth ulcer	Abdominal pain
<b>Skin and subcutaneous tissue disorders</b>		Angioedema	
<b>Musculoskeletal and connective tissue disorders</b>		Myalgia	

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 HPRA Pharmacovigilance, Earlsfort Terrace, IRL - Dublin 2; Tel: +353 1 6764971; Fax: +353 1 6762517. Website: [www.hpra.ie](http://www.hpra.ie); E-mail: [medsafety@hpra.ie](mailto:medsafety@hpra.ie).

**4.9 Overdose**

Symptoms

In case of acute overdose, the likely symptomatology may be peripheral vasodilation with a fall in blood pressure and reflex tachycardia.

Management

Monitoring of cardiac function and general supportive measures are recommended. If not successful, increase in

circulating plasma volume by substitution of fluid is recommended. In life-threatening situations, administration of vasopressors must be considered.

## 5 PHARMACOLOGICAL PROPERTIES

### 5.1 Pharmacodynamic properties

Pharmacotherapeutic group: Other vasodilators used in cardiac diseases, ATC code: C01DX16

#### Mechanism of action

Nicorandil, a nicotinamide ester, is a vasodilator agent with a dual mechanism of action, which leads to relaxation of smooth tonic vascular muscles in both venous and arterial part of vessels.

It possesses a potassium-channel opening effect. This activation of potassium channels induces vascular cell membrane hyperpolarisation with an arterial muscle relaxant effect, thereby leading to arterial dilatation and afterload reduction. In addition, the activation of the potassium channel leads to cardioprotective effects mimicking ischemic preconditioning.

Due to its nitrate moiety, nicorandil relaxes also vascular smooth muscle, particularly in the venous system via an increase in intracellular cyclic guanosine monophosphate (cGMP). This results in an increased pooling in capacitance vessels with a decrease in preload.

#### Pharmacodynamic effects

Nicorandil has been shown to exert a direct effect on the coronary arteries, both on normal and stenotic segments, without leading to a steal phenomenon. Furthermore, the reduction of end-diastolic pressure and wall tension decreases the extravascular component of vascular resistance. Ultimately, this results in an improved oxygen balance in the myocardium and improved blood flow in the post-stenotic areas of the myocardium.

Furthermore, nicorandil has demonstrated a spasmolytic activity in both in vitro and in vivo studies and reverses coronary spasm induced by methacholine or noradrenalin.

Nicorandil has no direct effect on myocardial contractility.

#### Clinical efficacy and safety

The IONA study was a randomised, double blind, placebo controlled study carried out in 5126 patients more than 45 years old with chronic stable angina, treated with standard antianginal therapies and at high risk of cardiovascular events defined by either: 1) previous myocardial infarction, or 2) coronary artery bypass grafting, or 3) coronary artery disease confirmed by angiography, or a positive exercise test in the previous two years, together with one of the following: left ventricular hypertrophy on the ECG, left ventricular ejection fraction  $\leq 45\%$ , or an end diastolic dimension of  $>55$  mm, age  $\geq 65$ , diabetes, hypertension, peripheral vascular disease, or cerebrovascular disease. Patients were excluded from the study if they were receiving a sulphonylurea as it was felt these patients may not benefit; (sulphonylurea agents have the potential to close potassium channels and may thus antagonise some of the effects of nicorandil). Study follow up for endpoint analysis was between 12 and 36 months with a mean of 1.6 years.

The composite primary endpoint (coronary heart disease (CHD) death, non-fatal myocardial infarction, or unplanned hospital admission for cardiac chest pain), occurred in 337 patients (13.1%) of patients treated with nicorandil 20 mg twice daily compared with 389 patients (15.5%) of patients receiving placebo (hazard ratio 0.83; 95% confidence interval (CI) 0.72 to 0.97;  $p=0.014$ ).

### 5.2 Pharmacokinetic properties

Nicorandil pharmacokinetics are linear from 5mg to 40mg.

#### Absorption

After oral administration, nicorandil is absorbed rapidly and completely from the gastrointestinal tract, independent from food intake. The absolute bioavailability is about 75 %. There is no significant hepatic first pass effect. Maximum plasma concentrations ( $C_{max}$ ) are reached after about 30- 60 minutes. The plasma concentration (and the area under the curve (AUC)) shows a linear proportionality to the dose.

Steady state is rapidly achieved (within 4 to 5 days) during repeated oral administration (bid regimen). At steady state, the accumulation ratio (based on AUC) is around 2 for 20 mg bid tablet and 1.7 for 10 mg bid tablet.

#### Distribution

Distribution of the product throughout the body remains stable, irrespective of dose, within the therapeutic range. The volume of distribution of nicorandil after intravenous (iv) dosing is 1.04 L/kg of body weight. Nicorandil is only slightly bound to human plasma proteins (bound fraction estimated at about 25%).

#### Biotransformation

Nicorandil is principally metabolised in the liver by denitration in a series of compounds without cardiovascular activity. In plasma unchanged nicorandil accounted for 45.5% of the radioactive AUC and the alcohol metabolite, N-(2-hydroxyethyl)-nicotinamide for 40.5%. The other metabolites accounted for the remaining 20% of radioactive AUC.

Nicorandil is mainly eliminated in urine as metabolites since parent product is less than 1 %, of the administered dose in human urines (0-48 hours). N-(2-hydroxyethyl)-nicotinamide is the most abundant metabolite (about 8.9% of the administered dose within 48 hours) followed by nicotinuric acid,( 5.7%), nicotinamide (1.34%), N-methyl-nicotinamide (0.61%) and nicotinic acid (0.40%). These metabolites represented the major route of transformation of nicorandil.

#### Elimination

Decrease in plasma concentrations occurs in two phases:

- a rapid phase with a half-life of 1 hour approximately, representing 96% of the plasma exposure;
- a slow elimination phase occurring approximately 12 hours following 20 mg oral dose bid.

After 4-5 mg intravenous dosing (5 min infusion), the total body clearance was approximately 40-55 L/hour.

Nicorandil and its metabolites are mainly excreted by urinary route, faecal excretion being very low.

#### Special patient groups

No clinically relevant modifications of the nicorandil pharmacokinetic profile is evidenced in population at risk such as elderly people, liver disease patients and chronic renal failure patients.

#### Pharmacokinetic interactions

The metabolism of nicorandil appears not to be significantly modified by cimetidine or rifampicine, respectively an inhibitor and an inducer of liver microsomal mixed-function oxidases.

## **5.3 Preclinical safety data**

Non-clinical data reveal no special hazard for humans based on conventional studies of safety pharmacology, repeated dose toxicity, genotoxicity and carcinogenic potential.

#### *Impairment of Fertility*

Fertility studies showed no effects on mating ability in either male or female rats, but decreases in the number of live fetuses and implantation sites were noted at high doses. Histopathological changes of the testes (diminished spermatogenic cells) were determined in repeat dose toxicity studies. Additional investigative studies for testicular toxicity revealed decreased blood flow in the testis and decreased blood levels of testosterone. These results suggest that testicular toxicity by nicorandil is related to a sustained decrease in blood flow caused by reduction of cardiac output. Upon cessation of treatment, recovery from nicorandil-induced testicular toxicity was observed after 4 weeks; which indicates that the observed changes are reversible.

#### *Embryotoxicity and peri- and post-natal toxicity*

Radioactivity passed through the placenta in pregnant rats after administration of radioactively marked nicorandil. Following exposure to nicorandil at doses that were maternally toxic, embryotoxicity was observed in the rat and rabbit. There was no evidence of teratogenicity (rat and rabbit), or abnormal pre- or postnatal physical or behavioural development (rat).

## **6 PHARMACEUTICAL PARTICULARS**

## **6.1 List of excipients**

Maize starch  
Croscarmellose sodium  
Stearic acid  
Mannitol

## **6.2 Incompatibilities**

Not applicable.

## **6.3 Shelf life**

2 years.

Each blister strip should be used within 30 days of opening.

## **6.4 Special precautions for storage**

Do not store above 25°C. Store in the original package.

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

Blister strips of 10 tablets per silica gel dessicant. Each tablet is connected via a channel to the dessicant capsule.

Pack sizes: blister packs of 10, 20, 30, 40, 50 and 60 tablets.

Not all pack sizes are marketed.

## **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**

No special requirements.

## **7 MARKETING AUTHORISATION HOLDER**

Sanofi-Aventis Ireland Ltd. T/A SANOFI  
Citywest Business Campus  
Dublin 24  
Ireland.

## **8 MARKETING AUTHORISATION NUMBER**

PA0540/102/002

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

Date of first authorisation: 17 October 1997

Date of last renewal: 17 October 2007

## **10 DATE OF REVISION OF THE TEXT**

October 2015