

**IRISH MEDICINES BOARD ACTS 1995 AND 2006**

**MEDICINAL PRODUCTS(CONTROL OF PLACING ON THE MARKET)REGULATIONS,2007**

**(S.I. No.540 of 2007)**

**PA1333/001/001**

Case No: 2040752

The Irish Medicines Board in exercise of the powers conferred on it by the above mentioned Regulations hereby grants to

**Morningside Healthcare Limited**

**115 Narborough Road, Leicester LE3 0PA, United Kingdom**

an authorisation, subject to the provisions of the said Regulations, in respect of the product

**Metformin Hydrochloride 500mg film coated tablets**

The particulars of which are set out in Part I and Part II of the attached Schedule. The authorisation is also subject to the general conditions as may be specified in the said Regulations as listed on the reverse of this document.

This authorisation, unless previously revoked, shall continue in force from **21/11/2007** until **23/08/2012**.

Signed on behalf of the Irish Medicines Board this

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A person authorised in that behalf by the said Board.

## Part II

### Summary of Product Characteristics

#### 1 NAME OF THE MEDICINAL PRODUCT

Metformin Hydrochloride 500mg film coated tablets

#### 2 QUALITATIVE AND QUANTITATIVE COMPOSITION

Each film coated tablet contains Metformin Hydrochloride 500 mg

For a full list of excipients, see section 6.1

#### 3 PHARMACEUTICAL FORM

Film-coated tablet.

White, circular, bi-convex film-coated tablet with diameter of 11mm.

#### 4 CLINICAL PARTICULARS

##### 4.1 Therapeutic Indications

###### Therapeutic indications

Treatment of type 2 diabetes mellitus in adults, particularly in overweight patients, when dietary management and exercise alone does not result in adequate glycemic control.

- **In adults, metformin** may be used as monotherapy or in combination with other oral anti-diabetic agents or with insulin.
- **In children aged 10 years and older and adolescents**, metformin may be used as monotherapy or in combination with insulin.

A reduction of diabetic complications has been shown in overweight type 2 adult diabetic patients treated with metformin as first-line therapy after diet failure (see section 5.1).

##### 4.2 Posology and method of administration

###### Adults

###### *Monotherapy and combination with other oral antidiabetic agents*

- The usual starting dose is one 500mg tablet 2 or 3 times daily given during or after meals. After 10 to 15 days the dose should be adjusted on the basis of blood glucose measurements. A slow increase of dose may improve gastrointestinal tolerability. The maximum recommended dose of metformin hydrochloride is 3 g daily taken as 2-3 divided doses
- If transfer from another oral antidiabetic agent is intended: discontinue the other agent and initiate metformin at the dose indicated above.

*Combination with insulin*

Metformin and insulin may be used in combination therapy to achieve better blood glucose control. Metformin is given at the usual starting dose of one tablet 2-3 times daily, while insulin dosage is adjusted on the basis of blood glucose measurements.

Elderly: due to the potential for decreased renal function in elderly subjects, metformin dosage should be adjusted based on renal function. Regular assessment of renal function is necessary (see section 4.4).

**Children and adolescents***Monotherapy and combination with insulin*

- Metformin may be given to children aged 10 years or older and adolescents
- The usual starting dose is one 500mg or 850mg tablet daily given during or after meals.
- After 10 to 15 days the dose should be adjusted on the basis of blood glucose measurements. A slow increase of dose may improve gastrointestinal tolerability.

The maximum recommended dose of metformin hydrochloride is 2g daily taken as 2-3 divided doses.

**4.3 Contraindications**

- Hypersensitivity to metformin hydrochloride or to any of the excipients.
- Diabetic ketoacidosis, diabetic pre-coma.
- Renal failure or renal dysfunction (creatinine clearance < 60mL/min).
- Acute conditions with the potential to alter renal function such as:
  - dehydration
  - severe infection
  - shock
  - intravascular administration of iodinated contrast agents (see section 4.4).
- Acute or chronic disease which may cause tissue hypoxia such as:
  - cardiac or respiratory failure
  - recent myocardial infarction
  - shock
- Hepatic insufficiency, acute alcohol intoxication, alcoholism
- Lactation

**4.4 Special warnings and precautions for use****Lactic acidosis.**

Lactic acidosis is a rare, but serious (high mortality in the absence of prompt treatment), metabolic complication that can occur due to metformin accumulation. Reported cases of lactic acidosis in patients on metformin have occurred primarily in diabetic patients with significant renal failure. The incidence of lactic acidosis can and should be reduced by assessing also other associated risk factors such as poorly controlled diabetes, ketosis, prolonged fasting, excessive alcohol intake, hepatic insufficiency and any condition associated with hypoxia.

**Diagnosis:**

Lactic acidosis is characterised by acidotic dyspnea, abdominal pain and hypothermia followed by coma. Diagnostic laboratory findings are decreased blood pH, plasma lactate levels above 5 mmol/L, and an increased anion gap and lactate/pyruvate ratio. If metabolic acidosis is suspected, metformin should be discontinued and the patient should be hospitalised immediately (see section 4.9).

**Renal function:**

As metformin is excreted by the kidney, serum creatinine levels should be determined before initiating treatment and regularly thereafter:

- at least annually in patients with normal renal function,
- at least two to four times a year in patients with serum creatinine levels at the upper limit of normal and in elderly subjects.

Decreased renal function in elderly subjects is frequent and asymptomatic. Special caution should be exercised in situations where renal function may become impaired, for example when initiating antihypertensive therapy or diuretic therapy and when starting therapy with an NSAID.

**Administration of iodinated contrast agent**

As the intravascular administration of iodinated contrast materials in radiologic studies can lead to renal failure, metformin should be discontinued prior to, or at the time of the test and not reinstituted until 48 hours afterwards, and only after renal function has been re-evaluated and found to be normal.

**Surgery:**

Metformin hydrochloride should be discontinued 48 hours before elective surgery with general anaesthesia and should not usually be resumed earlier than 48 hours afterwards.

**Children and adolescents:**

The diagnosis of diabetes mellitus type 2 must be confirmed before initiating treatment with metformin.

Long-term information about effects of metformin in growing and puberty is not available

Therefore, it is recommended to carefully monitor the effects of metformin in metformin-treated children, especially pre-pubescent children.

*Children aged between 10 and 12 years:*

Only 15 subjects aged between 10 and 12 years were included in the controlled clinical studies conducted in children and adolescents. Although metformin efficacy and safety in children between 10 and 12 did not differ from efficacy and safety in older children, particular caution is recommended when prescribing to children aged between 10 and 12 years.

**Other precautions:**

- All patients should continue their diet with a regular distribution of carbohydrate intake during the day. Overweight patients should continue their energy-restricted diet.
- The usual laboratory tests for diabetes monitoring should be performed regularly.
- Metformin alone never causes hypoglycaemia, although caution is advised when it is used in combination with insulin or sulfonylureas.

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

Concomitant use not recommended

Alcohol

Increased risk of lactic acidosis in acute alcohol intoxication, particularly in case of:

- fasting or malnutrition
- hepatic insufficiency

Avoid consumption of alcohol and alcohol-containing medications.

### Iodinated contrast agents (see section 4.4)

Intravascular administration of iodinated contrast agents may lead to renal failure, resulting in metformin accumulation and a risk of lactic acidosis.

Metformin should be discontinued prior to, or at the time of the test and not reinstituted until 48 hours afterwards, and only after renal function has been re-evaluated and found to be normal.

### Combinations requiring precautions for use

Glucocorticoids (systemic and local routes), beta-2-agonists, and diuretics have intrinsic hyperglycaemic activity. Inform the patient and perform more frequent blood glucose monitoring, especially at the beginning of treatment. If necessary, adjust the dosage of the antidiabetic drug during therapy with the other drug and upon its discontinuation. ACE-inhibitors may decrease the blood glucose levels. If necessary, adjust the dosage of the antidiabetic drug during therapy with the other drug and upon its discontinuation.

## 4.6 Pregnancy and lactation

To date, no relevant epidemiological data are available. Animal studies do not indicate harmful effects with respect to pregnancy, embryonal or foetal development, parturition or postnatal development (see also section 5.3)

When the patient plans to become pregnant and during pregnancy, diabetes should not be treated with metformin but insulin should be used to maintain blood glucose levels as close to normal as possible in order to lower the risk of foetal malformations associated with abnormal blood glucose levels.

Metformin is excreted into milk in lactating rats. Similar data are not available in humans and a decision should be made whether to discontinue nursing or to discontinue metformin, taking into account the importance of the compound to the mother.

## 4.7 Effects on ability to drive and use machines

Metformin monotherapy does not cause hypoglycaemia and therefore has no effect on the ability to drive or to use machines.

However, patients should be alerted to the risk of hypoglycaemia when metformin is used in combination with other antidiabetic agents (sulfonylureas, insulin, repaglinide).

## 4.8 Undesirable effects

The following undesirable effects may occur under treatment with metformin. Frequencies are defined as follows:

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)

#### Metabolism and nutrition disorders

*Very rare:* Decrease of vitamin B12 absorption with decrease of serum levels during long-term use of metformin. Consideration of such aetiology is recommended if a patient presents with megaloblastic anaemia.

*Very rare:* Lactic acidosis (see section 4.4.).

#### Nervous system disorders:

*Common:* Taste disturbance

#### Gastrointestinal disorders:

*Very common:* Gastrointestinal disorders such as nausea, vomiting, diarrhoea, abdominal pain and loss of appetite. These undesirable effects occur most frequently during initiation of therapy and resolve spontaneously in most cases. To prevent them, it is recommended that metformin be taken in 2 or 3 daily doses during or after meals. A slow increase of the dose may also improve gastrointestinal tolerability.

#### Hepatobiliary disorders:

*Isolated reports:* Liver function tests abnormalities or hepatitis resolving upon metformin discontinuation.

#### Skin and subcutaneous tissue disorders:

*Very rare:* Skin reactions such as erythema, pruritus, urticaria

In published and post marketing data and in controlled clinical studies in a limited paediatric population aged 10-16 years treated during 1 year, adverse event reporting was similar in nature and severity to that reported in adults.

## 4.9 Overdose

Hypoglycaemia has not been seen with metformin doses of up to 85g, although lactic acidosis has occurred in such circumstances. High overdose of metformin or concomitant risks may lead to lactic acidosis. Lactic acidosis is a medical emergency and must be treated in hospital. The most effective method to remove lactate and metformin is haemodialysis.

## 5 PHARMACOLOGICAL PROPERTIES

### 5.1 Pharmacodynamic properties

Pharmacotherapeutic Group: Blood Glucose lowering drugs, excl Insulins, Biguanides.

ATC code: A10BA02

Metformin is a biguanide with antihyperglycaemic effects, lowering both basal and postprandial plasma glucose. It does not stimulate insulin secretion and therefore does not produce hypoglycaemia.

Metformin may act via 3 mechanisms:

1. reduction of hepatic glucose production by inhibiting gluconeogenesis and glycogenolysis;
2. in muscle, by increasing insulin sensitivity, improving peripheral glucose uptake and utilisation;
3. delay of intestinal glucose absorption.

Metformin stimulates intracellular glycogen synthesis by acting on glycogen synthase.

Metformin increases the transport capacity of all types of membrane glucose transporters (GLUT).

In humans, independently of its action on glycaemia, metformin has favourable effects on lipid metabolism. This has been shown at therapeutic doses in controlled, medium-term or long-term clinical studies: metformin reduces total cholesterol, LDL cholesterol and triglyceride levels.

**Clinical efficacy:**

The prospective randomised (UKPDS) study has established the long-term benefit of intensive blood glucose control in adult patients *with* type 2 diabetes.

Analysis of the results for overweight patients treated with metformin after failure of diet alone showed:

- a significant reduction of the absolute risk of any diabetes-related complication in the metformin group (29.8 events/1000 patient-years) versus diet alone (43.3 events/1000 patient-years),  $p=0.0023$ , and versus the combined sulfonylurea and insulin monotherapy groups (40.1 events/1000 patient-years),  $p=0.0034$ .
- a significant reduction of the absolute risk of diabetes-related mortality: metformin 7.5 events/1000 patient-years, diet alone 12.7 events/1000 patient-years,  $p=0.017$ ;
- a significant reduction of the absolute risk of overall mortality: metformin 13.5 events/1000 patient-years versus diet alone 20.6 events/1000 patient-years ( $p=0.011$ ), and versus the combined sulfonylurea and insulin monotherapy groups 18.9 events/1000 patient-years ( $p=0.021$ );
- a significant reduction in the absolute risk of myocardial infarction: metformin 11 events/1000 patient-years, diet alone 18 events/1000 patient-years ( $p=0.01$ )

For metformin used as second-line therapy, in combination with a sulfonylurea, benefit regarding clinical outcome has not been shown.

In type 1 diabetes, the combination of metformin and insulin has been used in selected patients, but the clinical benefit of this combination has not been formally established.

Controlled clinical studies in a limited paediatric population aged 10-16 years treated during 1 year demonstrated a similar response in glycaemic control to that seen in adults.

**5.2 Pharmacokinetic properties****Absorption:**

After an oral dose of metformin,  $T_{max}$  is reached in 2.5 hours. Absolute bioavailability of a 500mg or 850mg metformin tablet is approximately 50-60% in healthy subjects. After an oral dose, the non-absorbed fraction recovered in faeces was 20-30%.

After oral administration, metformin absorption is saturable and incomplete. It is assumed that the pharmacokinetics of metformin absorption are non-linear.

At the usual metformin doses and dosing schedules, steady state plasma concentrations are reached within 24 to 48 hours and are generally less than 1  $\mu\text{g/ml}$ . In controlled clinical trials, maximum metformin plasma levels ( $C_{max}$ ) did not exceed 4  $\mu\text{g/ml}$ , even at maximum doses.

Food decreases the extent and slightly delays the absorption of metformin. Following administration of a dose of 850 mg, a 40% lower plasma peak concentration, a 25% decrease in AUC (area under the curve) and a 35 minute prolongation of time to peak plasma concentration were observed. The clinical relevance of these decreases is unknown.

**Distribution:**

Plasma protein binding is negligible. Metformin partitions into erythrocytes. The blood peak is lower than the plasma peak and appears at approximately the same time. The red blood cells most likely represent a secondary compartment of distribution. The mean  $V_d$  ranged between 63-276 L.

**Metabolism:**

Metformin is excreted unchanged in the urine. No metabolites have been identified in humans.

**Elimination:**

Renal clearance of metformin is > 400 ml/min, indicating that metformin is eliminated by glomerular filtration and tubular secretion. Following an oral dose, the apparent terminal elimination half-life is approximately 6.5 hours.

When renal function is impaired, renal clearance is decreased in proportion to that of creatinine and thus the elimination half-life is prolonged, leading to increased levels of metformin in plasma.

**Paediatrics:**

Single dose study: After single doses of metformin hydrochloride 500 mg, paediatric patients have shown similar pharmacokinetic profile to that observed in healthy adults.

Multiple dose study: Data are restricted to one study. After repeated doses of 500 mg BID for 7 days in paediatric patients the peak plasma concentration (C<sub>max</sub>) and systemic exposure (AUC<sub>0-t</sub>) were reduced by approximately 33% and 40%, respectively compared to diabetic adults who received repeated doses of 500 mg BID for 14 days. As the dose is individually titrated based on glycaemic control, this is of limited clinical relevance.

**5.3 Preclinical safety data**

Preclinical data reveal no special hazard for humans based on conventional studies on safety pharmacology, repeated dose toxicity, genotoxicity, carcinogenic potential, toxicity reproduction.

**6 PHARMACEUTICAL PARTICULARS****6.1 List of excipients**Core

Sodium starch glycollate (Type A)  
Maize starch  
Povidone K 30  
Colloidal anhydrous silica  
Magnesium stearate

Film-coating

Hypromellose  
Titanium dioxide E171  
Propylene glycol  
Macrogol 6000  
Purified talc

**6.2 Incompatibilities**

Not applicable.

**6.3 Shelf Life**

3 years.



## **6.4 Special precautions for storage**

Store below 25°C.

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

Polyvinyl chloride/Aluminum (PVC/Alu) -Blister packs of 20, 28, 30, 50, 56, 60, 84, 90, 100 or 120 tablets

Not all pack sizes may be marketed.

## **6.6 Special precautions for disposal**

No special requirements.

## **7 MARKETING AUTHORISATION HOLDER**

Morningside Healthcare Ltd  
115 Narborough Road  
Leicester  
LE3 0PA  
United Kingdom

## **8 MARKETING AUTHORISATION NUMBER**

PA 1333/1/1

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

The date of first authorisation: 24th August 2007.

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

November 2007