

## METFORMIN VIATRIS

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### 1. Product Name

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Metformin Viatriis, 500 mg, 850 mg & 1000 mg, film coated tablet

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### 2. Qualitative and Quantitative Composition

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Each film coated tablet contains 500 mg, 850 mg or 1000 mg of metformin hydrochloride.

For the full list of excipients, see section 6.1.

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### 3. Pharmaceutical Form

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Metformin Viatriis 500 mg: White, round, normal convex, film coated tablet, plain on both sides.

Metformin Viatriis 850 mg: White, round, normal convex, film coated tablet, plain on both sides.

Metformin Viatriis 1000 mg: White, oval, film coated tablet, debossed "MF" and "3" on either side of the break line on one side and "G" on the other side.

Do not halve the 500 mg and 850 mg tablets. Dose equivalence when the tablet is divided has not been established.

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### 4. Clinical Particulars

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#### 4.1 *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 glycaemic control.
- Metformin may be used as initial treatment or in sulfonylurea failures either alone or in combination with a sulfonylurea and other oral agents.
- Adjuvant therapy in insulin dependent diabetes especially if overweight.

#### 4.2 *Dose and method of administration*

**Life threatening lactic acidosis can occur due to accumulation of metformin. Risk factors include renal impairment, old age and doses of metformin above 2 g per day (see section 4.4).**

#### **Dose**

#### ***Monotherapy and combination with other oral antidiabetic agents in adults with normal renal function***

Initially 500 mg should be taken once or twice a day and, if necessary, increased over a few weeks up to a maximum of 1 g three times per day. The dose should be titrated with gradual dose increments until the desired effect is obtained. 500 mg three times a day is often sufficient to obtain diabetic control. Control may be attained within a few days but occasionally requires up to two weeks. Once control has been obtained, the dosage should be reviewed and reduced to the lowest maintenance level consistent with good diabetic control.

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The maximum dose of 3 g daily should only be used in patients with good renal function (i.e. creatinine clearance greater than 120 mL/min).

The action of metformin is progressive and no final assessment of the patient's real response should be made before the 21st day of treatment; blood sugar estimations are recommended during the initial 15 days of stabilisation. Metformin will not produce a hypoglycaemic state when used alone, however, it increases insulin effectiveness

### ***Combination with insulin or sulfonylureas in adults***

Metformin therapy with a sulfonylurea or insulin should be monitored by blood-sugar readings because combined therapy may cause hypoglycaemia. If it is decided to stabilise diabetic patients with metformin and insulin therapy, it is recommended that this is carried out in hospital because of the possibility of hypoglycaemia until the correct ratio of the two medicines is determined.

### ***Special populations***

#### **Elderly**

The initial and maintenance dosing of metformin should be conservative in elderly patients, due to the potential for decreased renal function in this population. Any dosage adjustment should be based on a careful assessment of renal function. Generally, elderly patients should not be titrated to the maximum dose of metformin.

#### **Renal impairment**

The risk of lactic acidosis is increased in patients with renal impairment. Metformin is contraindicated in patients with renal failure (creatinine clearance <15 mL/min), (see section 4.3).

Metformin may be used in patients with stable renal impairment (but see section 4.4). Where possible the dose should be titrated with gradual dose increments.

The maximum daily dose for patients with creatinine clearance between 15-30 mL/min is 500 mg.

The maximum daily dose for patients with creatinine clearance between 30-60 mL/min is 1000 mg.

The maximum daily dose for patients with creatinine clearance between 60-120 mL/min is 2000 mg.

It is recommended that metformin concentrations are checked after steady state has been reached (after 48 hours) to ensure metformin concentrations remain below 5 µg/mL (5 mg/L).

Renal function should be closely monitored (every 3-6 months).

If the creatinine clearance drops below 15 mL/min metformin must be discontinued.

#### **Debilitated or malnourished patients**

The dosing should be conservative and based on a careful assessment of renal function.

#### **Paediatric**

Metformin is not recommended for use in children.

#### **Method of administration**

It is important that the tablets are taken in divided doses with meals.

### **4.3 Contraindications**

Metformin is contraindicated in the following conditions:

- type 1/juvenile diabetes mellitus that is uncomplicated and well-regulated on insulin
- diabetes mellitus regulated by diet alone

- during or immediately following surgery where insulin is essential
- hypersensitivity to metformin hydrochloride and other biguanides, or to any of the excipients
- Any type of metabolic acidosis (such as lactic acidosis, diabetic ketoacidosis)
- diabetic precoma
- renal failure (creatinine clearance < 15 mL/minute) or renal dysfunction (creatinine clearance < 60 mL/minute)
- acute conditions with the potential to alter renal function such as dehydration, severe infection, shock, intravascular administration of iodinated contrast materials (see section 4.4)
- acute or chronic disease which may cause tissue hypoxia such as cardiac failure, recent myocardial infarction, respiratory failure, pulmonary embolism, shock, acute significant blood loss, sepsis, gangrene, pancreatitis
- elective major surgery (see section 4.4)
- severe 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 which can occur due to metformin accumulation. When it occurs, it is fatal in more than 25% of cases. Lactic acidosis is a medical emergency and must be treated in hospital immediately. Prompt haemodialysis is recommended to correct the acidosis and remove accumulated metformin (see section 4.9).

The risk of lactic acidosis increases with the degree of renal dysfunction and the patient's age. 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 other separate risk factors such as poorly controlled diabetes, ketosis, prolonged fasting, excessive alcohol intake, hepatic insufficiency and any condition associated with hypoxia.

When metformin is implicated as the cause of lactic acidosis, metformin plasma levels greater than 5 µg/mL (5 mg/L) are generally found (see section 5.2).

##### **Diagnosis**

The risk of lactic acidosis must be considered in the event of non-specific signs such as muscle cramps with digestive disorders such as abdominal pain and severe asthenia, malaise, myalgia, respiratory distress, increasing somnolence and non-specific abdominal distress.

Patients should be instructed to notify these signs to their physician immediately.

As lactic acidosis progresses there may be associated hypothermia, hypotension and resistant bradyarrhythmias with more marked acidosis. This can be followed by acidotic dyspnea and coma. Diagnostic laboratory findings are decreased blood pH, plasma lactate levels above 5 mmol/L with increased lactate/pyruvate ratio and electrolyte disturbances with an increased anion gap. If there is any suspicion of metabolic/lactic acidosis metformin should be discontinued and the patient hospitalised immediately. Prompt haemodialysis is recommended to correct the acidosis and remove accumulated metformin (see section 4.9).

##### **Patients with known or suspected mitochondrial diseases**

In patients with known mitochondrial diseases such as Mitochondrial Encephalopathy with Lactic Acidosis, and Stroke-like episodes (MELAS) syndrome and Maternal inherited diabetes and deafness (MIDD), metformin is not recommended due to the risk of lactic acidosis exacerbation and neurologic complications which may lead to worsening of the disease.

In case of signs and symptoms suggestive of MELAS syndrome or MIDD after the intake of metformin, treatment with metformin should be withdrawn immediately and prompt diagnostic evaluation should be performed.

## Renal impairment

Underlying renal disease, or a deterioration in renal function, result in reduced clearance of metformin and drug accumulation and are therefore major risk factors in lactic acidosis (see section 4.2). Creatinine clearance (this can be estimated from serum creatinine levels by using the Cockcroft-Gault formula) 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 patients.

Decreased renal function in elderly subjects is frequent and asymptomatic.

Particular caution should be paid in situations where renal function may become impaired such as dehydration, when starting therapy with a diuretic or when starting therapy with a non-steroidal anti-inflammatory drug (NSAID). In these situations metformin should be temporarily discontinued.

## Administration of iodinated contrast media

Radiological studies involving the use of intravascular iodinated contrast materials (for example intravenous urogram, intravenous cholangiography, angiography, any computed tomography scans with intravascular contrast materials) can lead to acute alteration of renal function and have been associated with lactic acidosis in patients receiving metformin. Therefore, metformin should be stopped at least 48 hours prior to, during and for 2 days after the radiological studies. For an emergency procedure, metformin should be stopped on admission. Metformin should be reinstated only after renal function has been re-evaluated and found to be normal.

## Surgery

Metformin must be discontinued 48 hours before elective surgery under general, spinal or peridural anaesthesia. Therapy may be restarted no earlier than 48 hours following surgery and only if normal renal function has been established.

## Hepatic impairment

Impaired hepatic function may significantly limit the ability to clear lactate. Metformin should be avoided in patients with severe hepatic insufficiency (see section 4.3) and used with caution in patients with milder disease.

## Heart failure

Type 2 diabetic patients with heart failure are at an increased risk of hypoperfusion and possible renal insufficiency. Careful monitoring of renal function is recommended when metformin is used in patients with cardiac failure.

## Alcohol

Alcohol is known to potentiate the effect of metformin on lactate metabolism. Patients should therefore be warned against excessive alcohol intake, acute or chronic, while taking metformin.

## 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.
- Periodic assessment of renal, hepatic and cardiovascular function is recommended during prolonged periods of treatment with metformin.
- Metformin hydrochloride alone does not cause hypoglycaemia; however, caution is advised when it is used in combination with other antidiabetic agents (sulphonylureas, glinides, insulin)

- Patients receiving continuous metformin therapy: It is recommended that serum vitamin B<sub>12</sub> levels be measured prior to initiation treatment with metformin, after 6 months treatment and thereafter annually because of reports of decreased vitamin B<sub>12</sub> absorption associated with metformin administration.
- Metformin may reduce vitamin B<sub>12</sub> serum levels. The risk of low vitamin B<sub>12</sub> levels increases with increasing metformin dose, treatment duration and/or in patients with risk factors known to cause vitamin B<sub>12</sub> deficiency. In case of suspicion of vitamin B<sub>12</sub> deficiency (such as anaemia or neuropathy), vitamin B<sub>12</sub> serum levels should be monitored. Periodic vitamin B<sub>12</sub> monitoring could be necessary in patients with risk factors for vitamin B<sub>12</sub> deficiency. Metformin therapy should be continued for as long as it is tolerated and not contra-indicated and appropriate corrective treatment for vitamin B<sub>12</sub> deficiency provided in line with current clinical guidelines.
- Metformin therapy should be temporarily stopped in the presence of any condition associated with hypoxaemia or dehydration, in patients suffering from serious infections or trauma (particularly if gastrointestinal disturbances are noted or acidosis is suspected).

### Use in the elderly

The risk of lactic acidosis in association with metformin is increased in elderly patients on long-term therapy due to the physiological alteration of the renal function and the possible accumulation of metformin. Metformin may be used in the elderly when the issues raised under sections 4.3 and 4.4 have been taken into consideration, the dosage is frequently reviewed and the renal function is closely monitored.

Decreased renal function in elderly subjects is frequent and asymptomatic. Special caution should be exercised in situations where renal function may become impaired.

### Paediatric use

Metformin is not recommended for use in children.

The diagnosis of type 2 diabetes mellitus should be confirmed before treatment with metformin is initiated.

No effect of metformin on growth and puberty has been detected during controlled clinical studies of one-year duration but clinical data in relation to the long-term effect of metformin on the development of skeletal and reproductive system in children and adolescents are not available. Therefore, a careful follow-up of the effect of metformin on these parameters in metformin-treated children, especially pre-pubescent children, is recommended.

### Effects on Laboratory Tests

No information is available.

## 4.5 *Interaction with other medicines and other forms of interaction*

### Contraindicated combinations

**Iodinated contrast media:** Metformin must be discontinued either 48 hours before the test when renal function is known to be impaired, or from the time of the test when renal function is known to be normal (see section 4.4).

### Inadvisable combinations

**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. Alcohol decreases blood glucose concentration by inhibiting hepatic glucose output, thus increasing the risk of hypoglycaemia and

can also mask its warning symptoms. The CNS depressant effects of alcohol plus hypoglycaemia can make driving or the operation of dangerous machinery much more hazardous. Excessive consumption of alcohol while on metformin may result in elevation of blood lactate.

### **Combinations requiring precautions for use**

Medicinal products with intrinsic hyperglycaemic activity (e.g. glucocorticoids and tetracosactides (systemic and local routes), beta-2-agonists, danazol, chlorpromazine at high dosages of 100 mg per day and diuretics:

More frequent blood glucose monitoring may be required, especially at the beginning of treatment. If necessary, adjust the metformin dosage during therapy with the respective medicinal product and upon discontinuation.

**Diuretics, especially loop diuretics:** May increase the risk of lactic acidosis due to their potential to decrease renal function.

**Thiazide diuretics:** Thiazide therapy may impair glucose tolerance. Dosage adjustment of metformin may be required.

**ACE inhibitors:** Co-administration of metformin and ACE inhibitors may result in a potentiation of the hypoglycaemic action. Monitoring of blood glucose should be undertaken during dosage adjustment of either agent.

**Calcium channel blockers:** Calcium channel blockers may affect glucose control in diabetic patients; regular monitoring of glycaemic control is recommended.

**Beta-blockers:** Co-administration of metformin and beta-blockers may result in a potentiation of the hypoglycaemic action. In addition, some of the premonitory signs of hypoglycaemia, in particular tachycardia, may be masked. Monitoring of blood glucose should be undertaken during dosage adjustment of either agent.

**Cimetidine:** Reduced clearance of metformin has been reported during cimetidine therapy, so a dose reduction should be considered.

**Anticoagulants:** Metformin increases the elimination rate of vitamin K antagonists. Consequently, the prothrombin time should be closely monitored in patients in whom metformin and vitamin K antagonists are being co-administered. Cessation of metformin in patients receiving vitamin K antagonists can cause marked increases in the prothrombin time.

**Nifedipine:** A single dose, metformin/nifedipine drug interaction study in normal healthy volunteers demonstrated that co-administration of metformin and nifedipine increased plasma metformin  $C_{max}$  and AUC by 20 and 9%, respectively, and increased the amount of metformin excreted in the urine.  $T_{max}$  and half-life of metformin were unaffected. Nifedipine appears to enhance the absorption of metformin. Metformin had minimal effects on the pharmacokinetics of nifedipine.

**Organic cation transporters (OCT):** Metformin is a substrate of both transporters OCT1 and OCT2.

Co-administration of metformin with:

- Substrates/inhibitors of OCT1 (such as verapamil) may reduce efficacy of metformin.
- Inducers of OCT1 (such as rifampicin) may increase gastrointestinal absorption and efficacy.
- Substrates/inhibitors of OCT2 (such as cimetidine, dolutegravir, crizotinib, olaparib, daclatasvir, vandetanib) may decrease the renal elimination of metformin and thus lead to an increase metformin plasma concentration.

**Carbonic anhydrase inhibitors:** Topiramate or other carbonic anhydrase inhibitors (e.g., zonisamide, acetazolamide or dichlorphenamide) frequently cause a decrease in serum bicarbonate and induce non-anion gap, hyperchloremic metabolic acidosis. Concomitant use of these drugs with

Metformin hydrochloride tablet may increase the risk for lactic acidosis. Consider more frequent monitoring of these patients.

NSAIDs: May increase the risk of lactic acidosis and adversely affect renal function.

**Therefore, caution is advised when these drugs are co-administered with metformin and a dose adjustment may be considered, particularly in patients with renal impairment.**

**Sulfonylureas and repaglinide:** During concomitant therapy with sulfonylureas and repaglinide, blood glucose should be monitored because combined therapy may cause hypoglycaemia.

**Thyroid products:** Thyroid products tend to produce hyperglycaemia and may therefore lead to loss of control.

**Corticosteroids:** Corticosteroids tend to produce hyperglycaemia and may lead to loss of control.

## **4.6 Fertility, pregnancy and lactation**

### **Fertility**

Fertility of male or female rats was unaffected by metformin administration at doses up to 600 mg/kg/day, or approximately twice the maximum recommended human daily dose on a body surface area basis.

### **Pregnancy**

Pregnancy category C

Hyperglycaemia in the periconceptional phase and/or during pregnancy affects at least 10% of all births worldwide. The mother is at risk of pregnancy-induced hypertension and preeclampsia, excessive gestational weight gain and birth complications. Insufficient glycaemic control leads to higher risk of pregnancy loss and congenital malformations than in normoglycemic women.

A register-based cohort study (10,129 pregnancy outcomes) on children with in-utero exposure to metformin alone (3,967 pregnancy outcomes), metformin in combination with insulin (889 pregnancy outcomes), and insulin alone (5,273 pregnancy outcomes) identified there was no increased risk of obesity, hypoglycaemia, hyperglycaemia or diabetes mellitus in the long-term amongst children with in-utero exposure metformin alone compared to those with insulin only.

The published data (meta-analyses, clinical studies, and registries) indicates no increased risk of congenital abnormalities nor fetoneonatal toxicity after exposure to metformin in the periconceptional phase and/or during pregnancy.

Children exposed to metformin in utero may have lower birthweight than those exposed to insulin. There is limited and conflicting evidence on the metformin effect on the long-term weight outcome of children exposed in utero. Metformin exposure in utero most likely has no negative impact on motor social development of children up to 4 years. The risk in children aged more than 4 years, cannot be established due to limitation of available data.

If clinically needed, the use of metformin can be considered during pregnancy and in the periconceptional phase as an addition or an alternative to insulin.

### **Breastfeeding**

Metformin is excreted into milk in lactating rats. Similar data are not available in humans and a decision should be made whether to discontinue breastfeeding or to discontinue metformin, taking into account the importance of the drug 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 (sulphonylureas, glinides, insulin).

#### **4.8 Undesirable effects**

The following undesirable effects may occur under treatment with metformin hydrochloride. Frequencies are defined as follows: very common: >1/10; common >1/100, <1/10; uncommon >1/1,000, <1/100; rare >1/10,000, <1/1,000; very rare <1/10,000; not known (cannot be estimated from the available data).

Within each frequency grouping, undesirable effects are presented in order of decreasing seriousness.

##### **Nervous system disorders**

*Common:* Taste disturbance.

##### **Gastrointestinal disorders**

*Very common:* Gastrointestinal disorders such as diarrhoea, nausea, vomiting, 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.

##### **Skin and subcutaneous tissue disorders**

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

##### **Metabolism and nutrition disorders**

*Common:*

- Vitamin B<sub>12</sub> decrease/deficiency. Decrease of vitamin B<sub>12</sub> absorption with a decrease in serum levels has been observed in patients treated long-term with metformin. Consideration of such an aetiology is recommended if a patient presents with megaloblastic anaemia. Therefore, serum B<sub>12</sub> levels should be appropriately monitored or periodic parenteral B<sub>12</sub> supplementation should be considered (see Section 4.4)

*Very rare:*

- Lactic acidosis (see section 4.4)

##### **Hepatobiliary disorders**

*Very rare:* Isolated reports of liver function test abnormalities or hepatitis resolving upon metformin discontinuation.

In clinical trials in children and adolescents with type 2 diabetes, the profile of adverse reactions was similar to that observed in adults.

Reporting suspected adverse reactions after authorisation of the medicine is important. It allows continued monitoring of the benefit/risk balance of the medicine. Healthcare professionals are asked to report any suspected adverse reactions <https://pophealth.my.site.com/carmreportnz/s/>.

#### **4.9 Overdose**

##### **Symptoms**

Hypoglycaemia has not been seen with ingestion of up to 85 g of metformin alone, although lactic acidosis has occurred in such circumstances. This disorder is a medical emergency and must be treated in hospital. The onset of lactic acidosis is often subtle and accompanied only by non-specific symptoms such as malaise, myalgia, respiratory distress, increasing somnolence and non-specific abdominal distress. There may be associated hypothermia, hypotension and resistant bradyarrhythmias with more marked acidosis. Lactic acidosis should be suspected in any diabetic patient with metabolic acidosis lacking evidence of ketoacidosis (ketonuria and ketonaemia).

## Treatment

Lactic acidosis may develop in diabetic metformin treated patients with overdose. Lactic acidosis is diagnosed and monitored by measurement of serum electrolytes, arterial pH and pCO<sub>2</sub> and arterial lactate plasma level.

The aim of treatment is to manage any underlying disorder and in some cases this will be sufficient to enable the body's homeostatic mechanism to correct the acid-base imbalance. The advantages of more active treatment of the acidosis must be balanced against the risks, including overalkalinisation with sodium bicarbonate. Because metformin hydrochloride is dialysable (with a clearance of up to 170 mL/min under good haemodynamic conditions), prompt haemodialysis is recommended to correct the acidosis and remove the accumulated metformin.

For risk assessment and advice on the management of overdose please contact the National Poisons Centre on 0800 POISON (0800 764 766).

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## 5. Pharmacological Properties

### 5.1 Pharmacodynamic properties

Pharmacotherapeutic group: Blood glucose lowering drugs, biguanides. ATC code: A10BA02.

#### Mechanism of action

Metformin is a biguanide with antihyperglycaemic effects on both basal and postprandial hyperglycaemia. It does not stimulate insulin secretion and therefore does not cause hypoglycaemia. Metformin reduces basal hyperinsulinemia, and, in combination with insulin, reduces insulin requirement.

Metformin exerts its antihyperglycemic effect via multiple mechanisms:

- Metformin reduces hepatic glucose production
- Metformin facilitates peripheral glucose uptake and utilisation, in part by increasing insulin action
- Metformin alters glucose turnover in the gut. Uptake from circulation is increased and absorption from food is decreased. Additional mechanisms attributed to the gut include an increase in release of glucagon-like peptide 1 (GLP-1) and a decrease of bile acid resorption. Metformin alters the gut microbiome.

Metformin can improve the lipid profile in hyperlipidaemic individuals.

In clinical studies, use of metformin was associated with either a stable body weight or modest weight loss.

Metformin is an adenosine monophosphate-protein-kinase (AMPK) activator and increases the transport capacity of all types of membrane glucose transporters (GLUTs).

#### Clinical trials

The prospective randomised (UKPDS) study has established the long-term benefit of intensive blood glucose control in 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/1,000 patient years) versus diet alone (43.3 events/1,000 patient years),  $p = 0.0023$ , and versus the combined sulfonylurea and insulin monotherapy groups (40.1 events/1,000 patient years),  $p = 0.0034$ ;
- a significant reduction of the absolute risk of diabetes related mortality: metformin 7.5 events/1,000 patient years, diet alone 12.7 events/1,000 patient years,  $p = 0.017$ ;
- a significant reduction of the absolute risk of overall mortality: metformin 13.5 events/1,000 patient years versus diet alone 20.6 events/1,000 patient years ( $p = 0.011$ ), and versus the combined sulfonylurea and insulin monotherapy groups 18.9 events/1,000 patient years ( $p = 0.021$ );
- a significant reduction in the absolute risk of myocardial infarction: metformin 11 events/1,000 patient years, diet alone 18 events/1,000 patient years ( $p = 0.01$ ).

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

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.

## **Paediatrics**

In a double blind, placebo-controlled study in 82 paediatric patients aged 10 to 16 years with type 2 diabetes (mean FPG 10.1 mmol/L), treatment with metformin (up to 2000 mg/day) for up to 16 weeks (mean duration of treatment 11 weeks) resulted in a significant mean net reduction in FPG of 3.6 mmol/L, compared with placebo.

## **5.2 Pharmacokinetic properties**

### **Absorption**

After oral administration, metformin hydrochloride is absorbed along the entire gastrointestinal mucosa. Studies using single oral doses of metformin tablets indicate that there is a lack of dose proportionality with increasing doses, which is due to decreased absorption rather than an increase in elimination. After oral administration, metformin absorption is saturable and incomplete. It is assumed that the pharmacokinetics of metformin absorption are non-linear.

At usual clinical doses and dosing schedules of metformin tablets, steady-state plasma concentrations are reached in 24 to 48 hours and are generally less than 1 µg/mL. During controlled clinical trials, maximum metformin plasma levels did not generally exceed 5 µg/mL, even at maximum doses.

### **Distribution**

Metformin is not bound to plasma proteins

### **Biotransformation**

Metformin is excreted unchanged in the urine and does not undergo hepatic metabolism.

### **Elimination**

In patients with decreased renal function (based on measured creatinine clearance), the plasma half-life of metformin is prolonged and renal clearance is decreased in proportion to the decrease in creatinine clearance, e.g. if creatinine clearance is 10 to 30 mL/min, renal clearance is reduced to 20% of normal.

## **Paediatrics**

Following an oral dose, children 12 years and older, have shown similar pharmacokinetic profile of metformin to that observed in adults. Pharmacokinetic data in children between 10 and 12 years are not available.

### **5.3 Preclinical safety data**

#### **Genotoxicity**

No evidence of a mutagenic potential of metformin was found in the Ames test (*S. typhimurium*), gene mutation test (mouse lymphoma cells), chromosomal aberrations test (human lymphocytes), or *in vivo* micronuclei formation test (mouse bone marrow).

#### **Carcinogenicity**

Long term carcinogenicity studies have been performed in rats (dosing duration of 104 weeks) and mice (dosing duration of 91 weeks) at doses up to and including 900 mg/kg/day and 1500 mg/kg/day, respectively. These doses are both approximately two to three times the recommended human daily dose on a body surface area basis. No evidence of carcinogenicity with metformin was found in either male or female mice. Similarly, there was no tumourigenic potential observed with metformin in male rats. However, an increased incidence of benign stromal uterine polyps was seen in female rats treated with 900 mg/kg/day.

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## **6. Pharmaceutical Particulars**

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### **6.1 List of excipients**

- Magnesium stearate
- povidone
- coating containing hypromellose, hypromellose and macrogols.

### **6.2 Incompatibilities**

Not applicable.

### **6.3 Shelf life**

3 years.

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

Store at or below 25°C.

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

500 mg tablets: HDPE bottle with polypropylene screw cap. Pack-sizes of 30, 100, 500 and 1000 tablets.

850 mg tablets: HDPE bottle with polypropylene screw cap. Pack-sizes of 30, 100, 250, 500 and 1000 tablets.

1000 mg tablets: HDPE bottle with polypropylene cap. Pack-sizes of 30, 100, 500 and 1000 tablets.

Not all pack types and sizes may be marketed.

### **6.6 Special precautions for disposal**

Not applicable.

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## 7. Medicines Schedule

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Prescription Medicine

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## 8. Sponsor Details

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Viatris Ltd  
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Ellerslie  
AUCKLAND  
www.viatris.co.nz  
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## 9. Date of First Approval

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10 July 2014            Metformin Viatris 500 mg and 850 mg film coated tablets

21 September 2017   Metformin Viatris 1000 mg film coated tablets

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## 10. Date of Revision of the Text

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9 March 2026

### Summary table of changes

Section	Summary of new information
4.4	Warning added for patients with mitochondrial diseases such as MELAS and MIDD.
4.6	Information on metformin as alternative or addition to insulin therapy added. Pregnancy Category definition removed.
5.1	Information updated in line with current scientific knowledge and brand leader.
5.3	Section content re-ordered.