

1. NAME OF THE MEDICINAL PRODUCT

Xenglu-Met 5 mg/1,000 mg film-coated tablets

2. QUALITATIVE AND QUANTITATIVE COMPOSITION

Xenglu-Met 5 mg/1,000 mg film-coated tablets

Each tablet contains 5 mg empagliflozin and 1,000 mg metformin hydrochloride.

For the full list of excipients, see section 6.1.

3. PHARMACEUTICAL FORM

Film-coated tablet (tablet).

White spindle biconvex core tablet engraved “EM” on one side and with a break line on the other side.

4. CLINICAL PARTICULARS

4.1 Therapeutic indications

This drug product is indicated in adults aged 18 years and older with type 2 diabetes mellitus as an adjunct to diet and exercise to improve glycaemic control

- in patients inadequately controlled on their maximally tolerated dose of metformin alone
- in patients inadequately controlled with metformin in combination with other glucose-lowering medicinal products, including insulin (see sections 4.5 and 5.1 for available data on different combinations)
- in patients already being treated with the combination of empagliflozin and metformin as separate tablets.

4.2 Posology and method of administration

Posology

The recommended dose is one tablet twice daily. The dosage should be individualised on the basis of the patient’s current regimen, effectiveness, and tolerability using the recommended daily dose of

10 mg or 25 mg of empagliflozin, while not exceeding maximum recommended daily dose of metformin.

For patients inadequately controlled on metformin monotherapy or metformin in combination with other glucose-lowering medicinal products including insulin

In patients not adequately controlled on metformin alone or in combination with other glucose-lowering medicinal products, including insulin, the recommended starting dose of This drug product should provide empagliflozin 5 mg twice daily (10 mg daily dose) and the dose of metformin similar to the dose already being taken. In patients tolerating a total daily dose of empagliflozin 10 mg and who need tighter glycaemic control, the dose can be increased to a total daily dose of empagliflozin 25 mg.

When This drug product is used in combination with a sulphonylurea and/or insulin, a lower dose of sulphonylurea and/or insulin may be required to reduce the risk of hypoglycemia (see sections 4.5 and 4.8).

For patients switching from separate tablets of empagliflozin and metformin

Patients switching from separate tablets of empagliflozin (10 mg or 25 mg total daily dose) and metformin to This drug product should receive the same daily dose of empagliflozin and metformin already being taken or the nearest therapeutically appropriate dose of metformin. For the different doses of metformin, This drug product is available in strengths of 5 mg empagliflozin plus 850 mg metformin hydrochloride, 5 mg empagliflozin plus 1,000 mg metformin hydrochloride, 12.5 mg empagliflozin plus 850 mg metformin hydrochloride, and 12.5 mg empagliflozin plus 1,000 mg metformin hydrochloride.

Special populations Renal impairment

No dose adjustment is recommended for patients with mild renal impairment. This medicinal product must not be used in patients with moderate or severe renal impairment (creatinine clearance <60 ml/min) (see sections 4.3 and 4.4).

Hepatic impairment

This medicinal product must not be used in patients with hepatic impairment (see sections 4.3, 4.4 and 5.2).

Elderly

Due to the mechanism of action, decreased renal function will result in reduced efficacy of empagliflozin. Because metformin is excreted by the kidney and elderly patients are more likely to have decreased renal function, This drug product should be used with caution in these patients. Monitoring of renal function is necessary to aid in prevention of metformin-associated lactic acidosis, particularly in elderly patients (see sections 4.3 and 4.4). In patients 75 years and older, an increased risk for volume depletion should be taken into account (see sections 4.4 and 4.8). Due to the limited therapeutic experience with empagliflozin in patients aged 85 years and older, initiation of therapy in this population is not recommended (see section 4.4).

Paediatric population

The safety and efficacy of This drug product in children and adolescents aged 0 to 18 years has not been established. No data are available.

Method of administration

This drug product should be taken twice daily with meals to reduce the gastrointestinal adverse reactions associated with metformin. All patients should continue their diet with an adequate distribution of carbohydrate intake during the day. Overweight patients should continue their energy restricted diet.

If a dose is missed, it should be taken as soon as the patient remembers. However, a double dose should not be taken on the same time. In that case, the missed dose should be skipped.

4.3 Contraindications

- Hypersensitivity to the active substances or to any of the excipients listed in section 6.1.
- Diabetic ketoacidosis, diabetic pre-coma.
- Renal failure or renal dysfunction (creatinine clearance <60 ml/min).
- Acute conditions with the potential to alter renal function such as: dehydration, severe infection, shock.

- Disease which may cause tissue hypoxia (especially acute disease, or worsening of chronic disease) such as: decompensated heart failure, respiratory failure, recent myocardial infarction, shock.
- Hepatic impairment, acute alcohol intoxication, alcoholism (see section 4.5).

4.4 Special warnings and precautions for use

General

This drug product should not be used in patients with type 1 diabetes. Diabetic ketoacidosis
Rare cases of diabetic ketoacidosis (DKA), including life-threatening cases, have been reported in clinical trials and post marketing in patients treated with SGLT2 inhibitors, including empagliflozin. In a number of cases, the presentation of the condition was atypical with only moderately increased blood glucose values, below 14 mmol/l (250 mg/dl). It is not known if DKA is more likely to occur with higher doses of empagliflozin.

The risk of diabetic ketoacidosis must be considered in the event of non-specific symptoms such as nausea, vomiting, anorexia, abdominal pain, excessive thirst, difficulty breathing, confusion, unusual fatigue or sleepiness. Patients should be assessed for ketoacidosis immediately if these symptoms occur, regardless of blood glucose level.

In patients where DKA is suspected or diagnosed, treatment with empagliflozin should be discontinued immediately.

Treatment should be interrupted in patients who are hospitalised for major surgical procedures or acute serious medical illnesses. In both cases, treatment with empagliflozin may be restarted once the patient's condition has stabilised.

Before initiating empagliflozin, factors in the patient history that may predispose to ketoacidosis should be considered.

Patients who may be at higher risk of DKA include patients with a low beta-cell function reserve (e.g. type 2 diabetes patients with low C-peptide or latent autoimmune diabetes in adults (LADA) or patients with a history of pancreatitis), patients with conditions that lead to restricted food intake or severe dehydration, patients for whom insulin doses are reduced and patients with increased insulin requirements due to acute medical illness, surgery or alcohol abuse. SGLT2 inhibitors should be used with caution in these patients.

Restarting SGLT2 inhibitor treatment in patients with previous DKA while on SGLT2 inhibitor treatment is not recommended, unless another clear precipitating factor is identified and resolved.

The safety and efficacy of empagliflozin in patients with type 1 diabetes have not been established and empagliflozin should not be used for treatment of patients with type 1 diabetes. Limited data from clinical trials suggest that DKA occurs with common frequency when patients with type 1 diabetes are treated with SGLT2 inhibitors.

Lactic acidosis

Lactic acidosis is a very 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 renal failure or acute worsening of renal function. Special caution should be paid to situations where renal function may become impaired, for example in case of dehydration (severe diarrhoea or vomiting), or when initiating antihypertensive therapy or diuretic therapy and

when starting therapy with a non-steroidal anti-inflammatory drug (NSAID). In the acute conditions listed, metformin should be temporarily discontinued.

Other associated risk factors should be considered to avoid lactic acidosis such as poorly controlled diabetes, ketosis, prolonged fasting, excessive alcohol intake, hepatic impairment and any condition associated with hypoxia (such as decompensated cardiac failure, acute myocardial infarction) (see section 4.3).

The risk of lactic acidosis must be considered in the event of non-specific signs such as muscle cramps, digestive disorders as abdominal pain and severe asthenia. Patients should be instructed to notify these signs immediately to their physicians if they occur, notably if patients had a good tolerance to This drug product before. This drug product should be discontinued, at least temporarily, until the situation is clarified. Reintroduction of This drug product should then be discussed taking into account the benefit/risk ratio in an individual basis as well as renal function.

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. In case of lactic acidosis, the patient should be hospitalised immediately (see section 4.9).

Physicians should alert the patients on the risk and on the symptoms of lactic acidosis.

Renal impairment

Due to the mechanism of action, decreased renal function will result in reduced efficacy of empagliflozin. Metformin is excreted by the kidney. Therefore, 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 patients is frequent and asymptomatic. Special caution should be exercised in situations where renal function may become impaired, for example in case of dehydration, or when initiating antihypertensive therapy or diuretic therapy and when starting therapy with a non-steroidal anti-inflammatory drug (NSAID).

In these cases, it is also recommended to check renal function before initiating treatment with This drug product.

Cardiac function

Patients with heart failure are more at risk of hypoxia and renal insufficiency. In patients with stable chronic heart failure, This drug product may be used with a regular monitoring of cardiac and renal function. For patients with acute and unstable heart failure, This drug product is contraindicated due to the metformin component (see section 4.3).

Hepatic injury

Cases of hepatic injury have been reported with empagliflozin in clinical trials. A causal relationship between empagliflozin and hepatic injury has not been established.

Administration of iodinated contrast agent

The intravascular administration of iodinated contrast materials in radiologic studies can lead to renal failure. This may induce metformin accumulation and may increase the risk for lactic acidosis.

Therefore, this medicinal product must be discontinued prior to, or at the time of the test and not be reinstated until at least 48 hours afterwards, and only after renal function has been re-evaluated and has not deteriorated further (see section 4.5).

Surgery

As this medicinal product contains metformin, the treatment must be discontinued 48 hours before elective surgery with general, spinal or peridural anaesthesia. Therapy should usually not be resumed earlier than 48 hours following surgery and only after renal function has been reevaluated and found to be normal.

Risk for volume depletion

Based on the mode of action of SGLT2 inhibitors, osmotic diuresis accompanying therapeutic glucosuria may lead to a modest decrease in blood pressure (see section 5.1). Therefore, caution should be exercised in patients for whom a empagliflozin-induced drop in blood pressure could pose a risk, such as patients with known cardiovascular disease, patients on anti-hypertensive therapy with a history of hypotension or patients aged 75 years and older. In case of conditions that may lead to fluid loss (e.g. gastrointestinal illness), careful monitoring of volume status (e.g. physical examination, blood pressure measurements, laboratory tests including haematocrit) and electrolytes is recommended for patients receiving This drug product. Temporary interruption of treatment with This drug product should be considered until the fluid loss is corrected.

Urinary tract infections

The overall frequency of urinary tract infection reported as adverse event was higher in patients treated with empagliflozin 10 mg on a background of metformin compared to patients treated with placebo or empagliflozin 25 mg on a background of metformin (see section 4.8). Complicated urinary tract infection (e.g. pyelonephritis or urosepsis) occurred at a similar frequency in patients treated with empagliflozin compared to placebo. However, temporary interruption of treatment should be considered in patients with complicated urinary tract infections.

Elderly

The effect of empagliflozin on urinary glucose excretion is associated with osmotic diuresis, which could affect the hydration status. Patients aged 75 years and older may be at an increased risk of volume depletion. Therapeutic experience in patients aged 85 years and older is limited. Initiation of therapy in this population is not recommended (see section 4.2).

Cardiac failure

Experience in New York Heart Association (NYHA) class I-II is limited, and there is no experience in clinical studies with empagliflozin in NYHA class III-IV.

Urine laboratory assessments

Due to its mechanism of action, patients taking This drug product will test positive for glucose in their urine.

4.5 Interaction with other medicinal products and other forms of interaction

Co-administration of multiple doses of empagliflozin and metformin does not meaningfully alter the pharmacokinetics of either empagliflozin or metformin in healthy subjects.

No interaction studies have been performed for This drug product. The following statements reflect the information available on the individual active substances.

Empagliflozin

Pharmacodynamic interactions

Diuretics

As This drug product contains empagliflozin it may add to the diuretic effect of thiazide and loop diuretics and may increase the risk of dehydration and hypotension (see section 4.4).

Insulin and insulin secretagogues

Insulin and insulin secretagogues, such as sulphonylureas, may increase the risk of hypoglycaemia. Therefore, a lower dose of insulin or an insulin secretagogue may be required to reduce the risk of hypoglycaemia when used in combination with empagliflozin (see sections 4.2 and 4.8).

Pharmacokinetic interactions

Effects of other medicinal products on empagliflozin

In vitro data suggest that the primary route of metabolism of empagliflozin in humans is glucuronidation by uridine 5'-diphosphoglucuronosyltransferases UGT1A3, UGT1A8, UGT1A9, and UGT2B7. Empagliflozin is a substrate of the human uptake transporters OAT3, OATP1B1, and OATP1B3, but not OAT1 and OCT2. Empagliflozin is a substrate of P-glycoprotein (P-gp) and breast cancer resistance protein (BCRP).

Co-administration of empagliflozin with probenecid, an inhibitor of UGT enzymes and OAT3, resulted in a 26% increase in peak empagliflozin plasma concentrations (C_{max}) and a 53% increase in area under the concentration-time curve (AUC). These changes were not considered to be clinically meaningful.

The effect of UGT induction on empagliflozin has not been studied. Co-medication with known inducers of UGT enzymes should be avoided due to a potential risk of decreased efficacy.

An interaction study with gemfibrozil, an *in vitro* inhibitor of OAT3 and OATP1B1/1B3 transporters, showed that empagliflozin C_{max} increased by 15% and AUC increased by 59% following co-administration. These changes were not considered to be clinically meaningful.

Inhibition of OATP1B1/1B3 transporters by co-administration with rifampicin resulted in a 75% increase in C_{max} and a 35% increase in AUC of empagliflozin. These changes were not considered to be clinically meaningful.

Empagliflozin exposure was similar with and without co-administration with verapamil, a P-gp inhibitor, indicating that inhibition of P-gp does not have any clinically relevant effect on empagliflozin.

Interaction studies conducted in healthy volunteers suggest that the pharmacokinetics of empagliflozin were not influenced by co-administration with metformin, glimepiride, pioglitazone, sitagliptin, linagliptin, warfarin, verapamil, ramipril, simvastatin, torasemide and hydrochlorothiazide.

Effects of empagliflozin on other medicinal products

Based on *in vitro* studies, empagliflozin does not inhibit, inactivate, or induce CYP450 isoforms. Empagliflozin does not inhibit UGT1A1, UGT1A3, UGT1A8, UGT1A9, or UGT2B7. Drug-drug interactions involving the major CYP450 and UGT isoforms with empagliflozin and concomitantly administered substrates of these enzymes are therefore considered unlikely.

Empagliflozin does not inhibit P-gp at therapeutic doses. Based on *in vitro* studies, empagliflozin is considered unlikely to cause interactions with medicinal products that are P-gp substrates.

Co-administration of digoxin, a P-gp substrate, with empagliflozin resulted in a 6% increase in AUC and 14% increase in C_{max} of digoxin. These changes were not considered to be clinically meaningful.

Empagliflozin does not inhibit human uptake transporters such as OAT3, OATP1B1, and OATP1B3 *in vitro* at clinically relevant plasma concentrations and, as such, drug-drug interactions with substrates of these uptake transporters are considered unlikely.

Interaction studies conducted in healthy volunteers suggest that empagliflozin had no clinically relevant effect on the pharmacokinetics of metformin, glimepiride, pioglitazone, sitagliptin, linagliptin, simvastatin, warfarin, ramipril, digoxin, diuretics and oral contraceptives.

Metformin

Combinations not recommended

There is increased risk of lactic acidosis in acute alcohol intoxication (particularly in the case of fasting, malnutrition or hepatic impairment due to the metformin active substance (see section 4.4)). Consumption of alcohol and medicinal products containing alcohol should be avoided.

Cationic substances that are eliminated by renal tubular secretion (e.g. cimetidine) may interact with metformin by competing for common renal tubular transport systems.

The intravascular administration of iodinated contrast agents in radiological studies may lead to renal failure, resulting in metformin accumulation and a risk of lactic acidosis. Therefore, this medicinal product must be discontinued prior to, or at the time of the test and not reinstated until 48 hours afterwards, and only after renal function has been re-evaluated and has not deteriorated further (see section 4.4).

Combination requiring precautions for use

Glucocorticoids (given by systemic and local routes), beta-2-agonists, and diuretics have intrinsic hyperglycaemic activity. The patient should be informed and more frequent blood glucose monitoring performed, especially at the beginning of treatment with such medicinal products. If necessary, the dose of the anti-hyperglycaemic medicinal product should be adjusted during therapy with the other medicinal product and on its discontinuation.

Insulin and insulin secretagogues

Insulin and insulin secretagogues, such as sulphonylureas, may increase the risk of hypoglycaemia. Therefore, a lower dose of insulin or an insulin secretagogue may be required

to reduce the risk of hypoglycaemia when used in combination with metformin (see sections 4.2 and 4.8).

4.6 Fertility, pregnancy and lactation

Pregnancy

There are no data from the use of this medicinal product or empagliflozin in pregnant women. Animal studies show that empagliflozin crosses the placenta during late gestation to a very limited extent but do not indicate direct or indirect harmful effects with respect to early embryonic development.

However, animal studies have shown adverse effects on postnatal development. A limited amount of data suggests that the use of metformin in pregnant women is not associated with an increased risk of congenital malformations. Animal studies with the combination of empagliflozin and metformin or with metformin alone have shown reproductive toxicity at higher doses of metformin only (see section 5.3).

When the patient plans to become pregnant, and during pregnancy, it is recommended that diabetes is not treated with this medicinal product, but insulin be used to maintain blood glucose levels as close to normal as possible, to reduce the risk of malformations of the foetus associated with abnormal blood glucose levels.

Breast-feeding

Metformin is excreted into human milk. No effects have been shown in breastfed newborns/infants of treated women. No data in humans are available on excretion of empagliflozin into milk. Available animal data have shown excretion of empagliflozin and metformin in milk. A risk to the newborns/infants cannot be excluded.

This medicinal product should not be used during breast feeding.

Fertility

No studies on the effect on human fertility have been conducted for this medicinal product or empagliflozin. Animal studies with empagliflozin and metformin do not indicate direct or indirect harmful effects with respect to fertility (see section 5.3).

4.7 Effects on ability to drive and use machines

This drug product has minor influence on the ability to drive and use machines. Patients should be advised to take precautions to avoid hypoglycaemia while driving and using machines, in particular when This drug product is used in combination with a sulphonylurea and/or insulin.

4.8 Undesirable effects

Summary of the safety profile

A total of 7052 patients with type 2 diabetes were treated in clinical studies to evaluate the safety of empagliflozin as add-on to metformin, of which 4740 patients were treated with empagliflozin as add-on to metformin.

Placebo controlled double-blinded trials of 18 to 24 weeks of exposure included 3456 patients, of which 1271 were treated with empagliflozin 10 mg as add-on to metformin and 1259 with empagliflozin 25 mg as add-on to metformin. The most commonly reported adverse events in clinical trials were hypoglycaemia in combination with insulin and/or sulphonylurea, urinary tract infections,

genital tract infections and increased urination (see description of selected side effects). No additional adverse reactions were identified in clinical trials with empagliflozin as add-on to metformin compared to the side effects of the single components.

Tabulated list of adverse reactions

The adverse reactions are listed by absolute frequency. 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 $< 1/1,000$), or very rare ($< 1/10,000$), and not known (cannot be estimated from the available data).

Table 1 Adverse reactions reported in placebo-controlled studies

System organ class	Very common	Common	Uncommon	Rare	Very rare
<i>Infections and infestations</i>		Vaginal moniliasis, vulvovaginitis, balanitis and other genital infection ^{1, 2} Urinary tract infection ^{1, 2}			
<i>Metabolism and nutrition disorders</i>	Hypoglycaemia (when used with sulphonylurea or insulin) ¹			Diabetic ketoacidosis ^{a, b}	Lactic acidosis ³ Vitamin B12 deficiency ^{3, 4}
<i>Nervous system disorders</i>		Taste disturbance ³			
<i>Vascular disorders</i>			Volume depletion ^{1, 2}		
<i>Gastrointestinal disorders</i>	Gastrointestinal symptoms ^{3, 5}				
<i>Hepatobiliary disorders</i>					Liver function tests abnormalities ³ Hepatitis ³
<i>Skin and subcutaneous tissue disorders</i>		Pruritus (generalised)			Erythema ³ Urticaria ³
<i>Renal and urinary disorders</i>		Increased urination ^{1, 2}	Dysuria ²		

¹ See subsections below for additional information

² Identified adverse reactions of empagliflozin monotherapy

³ Identified adverse reactions of metformin monotherapy

⁴ Long-term treatment with metformin has been associated with a decrease in vitamin B12 absorption which may very rarely result in clinically significant vitamin B12 deficiency (e.g. megaloblastic anaemia)

⁵ Gastrointestinal symptoms such as nausea, vomiting, diarrhoea, abdominal pain and loss of appetite occur most frequently during initiation of therapy and resolve spontaneously in most cases.

^a derived from postmarketing experience

^b see section 4.4

Description of selected adverse reactions

Hypoglycaemia

The frequency of hypoglycaemia depended on the background therapy in the respective studies.

Overall hypoglycaemia

The frequency of patients with hypoglycaemic events was similar for empagliflozin and placebo as add-on to metformin. An increased frequency was noted when empagliflozin given as add-on to metformin and a sulfonylurea (empagliflozin 10 mg: 16.1%, empagliflozin 25 mg: 11.5% and placebo: 8.4%) or as add-on to metformin and insulin (empagliflozin 10 mg: 31.3%, empagliflozin 25 mg: 36.2% and placebo: 34.7%).

Major hypoglycaemia (hypoglycaemia requiring assistance)

The frequency of patients with major hypoglycaemic events was low (<1%) and similar for empagliflozin and placebo as add-on to metformin. Major hypoglycaemic events occurred in 0.5%, 0% and 0.5% of patients treated with empagliflozin 10 mg, empagliflozin 25 mg and placebo when added on to metformin and insulin, respectively. No patient had a major hypoglycaemic event in the combination with metformin and a sulphonylurea.

Urinary tract infection

The overall frequency of urinary tract infection adverse events was higher in metformin-treated patients who received empagliflozin 10 mg (8.8%) compared to empagliflozin 25 mg (6.6%) or placebo (7.8%). Similar to placebo, urinary tract infection was reported more frequently for empagliflozin in patients with a history of chronic or recurrent urinary tract infections. The intensity of urinary tract infections (i.e. mild/moderate/severe) was similar to placebo. Urinary tract infection events were reported more frequently for empagliflozin 10 mg compared with placebo in female patients, but not for empagliflozin 25 mg. The frequencies of urinary tract infections were low for male patients and were balanced across treatment groups.

Vaginal moniliasis, vulvovaginitis, balanitis and other genital infection

Vaginal moniliasis, vulvovaginitis, balanitis and other genital infections were reported more frequently in metformin-treated patients who received empagliflozin 10 mg (4.0%) and empagliflozin 25 mg (3.9%) compared to placebo (1.3%), and were reported more frequently for empagliflozin compared to placebo in female patients. The difference in frequency was less pronounced in male patients. Genital tract infections were mild and moderate in intensity, none was severe in intensity.

Increased urination

As expected from the mechanism of action, increased urination (as assessed by PT search including pollakiuria, polyuria, nocturia) was observed at higher frequencies in metformin-treated patients who received empagliflozin 10 mg (3.0%) and empagliflozin 25 mg (2.9%) compared to placebo (1.4%) as add-on to metformin therapy. Increased urination was mostly

mild or moderate in intensity. The frequency of reported nocturia was comparable between placebo and empagliflozin (<1%).

Volume depletion

The overall frequency of volume depletion (including the predefined terms blood pressure (ambulatory) decreased, blood pressure systolic decreased, dehydration, hypotension, hypovolaemia, orthostatic hypotension, and syncope) in metformin-treated patients who received empagliflozin was low: 0.6% for empagliflozin 10 mg, 0.3% for empagliflozin 25 mg and 0.1% for placebo. The effect of empagliflozin on urinary glucose excretion is associated with osmotic diuresis, which could affect hydration status of patients age 75 years and older. In patients ≥ 75 years of age volume depletion events have been reported in a single patient treated with empagliflozin 25 mg as add-on to metformin therapy.

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 the Pharmacy and Poisons Board Pharmacovigilance Electronic Reporting System (PvERS) at <https://pv.pharmacyboardkenya.org>.

4.9 Overdose

Symptoms

Empagliflozin

In controlled clinical studies single doses of up to 800 mg empagliflozin (equivalent to 32-times the highest recommended daily dose) in healthy volunteers and multiple daily doses of up to 100 mg empagliflozin (equivalent to 4-times the highest recommended daily dose) in patients with type 2 diabetes did not show any toxicity. Empagliflozin increased urine glucose excretion leading to an increase in urine volume. The observed increase in urine volume was not dose-dependent and is not clinically meaningful. There is no experience with doses above 800 mg in humans.

Metformin

Hypoglycaemia has not been seen with metformin doses of up to 85 g, 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.

Therapy

In the event of an overdose, treatment should be initiated as appropriate to the patient's clinical status. The most effective method to remove lactate and metformin is haemodialysis. The removal of empagliflozin by haemodialysis has not been studied.

5. PHARMACOLOGICAL PROPERTIES

5.1 Pharmacodynamic properties

Pharmacotherapeutic group: Drugs used in diabetes, combinations of oral blood glucose lowering drugs, ATC code: A10BD20

Mechanism of action

This drug product combines two antihyperglycaemic medicinal products with complementary mechanisms of action to improve glycaemic control in patients with type 2 diabetes: empagliflozin, an inhibitor of sodium-glucose co-transporter 2 (SGLT2), and metformin hydrochloride, a member of the biguanide class.

Empagliflozin

Empagliflozin is a reversible, highly potent (IC_{50} of 1.3 nmol) and selective competitive inhibitor of SGLT2. Empagliflozin does not inhibit other glucose transporters important for glucose transport into peripheral tissues and is 5000-times more selective for SGLT2 versus SGLT1, the major transporter responsible for glucose absorption in the gut. SGLT2 is highly expressed in the kidney, whereas expression in other tissues is absent or very low. It is responsible, as the predominant transporter, for the reabsorption of glucose from the glomerular filtrate back into the circulation. In patients with type 2 diabetes and hyperglycaemia a higher amount of glucose is filtered and reabsorbed.

Empagliflozin improves glycaemic control in patients with type 2 diabetes by reducing renal glucose reabsorption. The amount of glucose removed by the kidney through this glucuretic mechanism is dependent on blood glucose concentration and GFR. Inhibition of SGLT2 in patients with type 2 diabetes and hyperglycaemia leads to excess glucose excretion in the urine.

In patients with type 2 diabetes, urinary glucose excretion increased immediately following the first dose of empagliflozin and is continuous over the 24 hour dosing interval. Increased urinary glucose excretion was maintained at the end of the 4-week treatment period, averaging approximately 78 g/day with empagliflozin 25 mg. Increased urinary glucose excretion resulted in an immediate reduction in plasma glucose levels in patients with type 2 diabetes.

Empagliflozin improves both fasting and post-prandial plasma glucose levels. The mechanism of action of empagliflozin is independent of beta cell function and insulin pathway and this contributes to a low risk of hypoglycaemia. Improvement of surrogate markers of beta cell function including Homeostasis Model Assessment- β (HOMA- β) was noted. In addition, urinary glucose excretion triggers calorie loss, associated with body fat loss and body weight reduction. The glucosuria observed with empagliflozin is accompanied by mild diuresis which may contribute to sustained and moderate reduction of blood pressure.

Metformin

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:

- reduction of hepatic glucose production by inhibiting gluconeogenesis and glycogenolysis,
- in muscle, by increasing insulin sensitivity, improving peripheral glucose uptake and utilization,
- and 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 (GLUTs) known to date.

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 and safety

A total of 4704 patients with type 2 diabetes were treated in 7 double-blind, placebo or active-controlled clinical studies of at least 24 weeks duration, of which 1109 patients received empagliflozin 10 mg and 1863 received empagliflozin 25 mg as add-on to metformin therapy. Of these, a total of 530 patients received empagliflozin as add-on to metformin plus insulin, of which 266 patients were treated with empagliflozin 10 mg and 264 with empagliflozin 25 mg.

Treatment with empagliflozin in combination with metformin with or without other antidiabetic medicinal products (pioglitazone, sulphonylurea, DPP-4 inhibitors, and insulin) led to clinically relevant improvements in HbA1c, fasting plasma glucose (FPG), body weight, systolic and diastolic blood pressure. Administration of empagliflozin 25 mg resulted in a higher proportion of patients achieving HbA1c goal of less than 7% and fewer patients needing glycaemic rescue compared to empagliflozin 10 mg and placebo. In patients age 75 years and older, numerically lower reductions in HbA1c were observed with empagliflozin treatment. Higher baseline HbA1c was associated with a greater reduction in HbA1c.

Empagliflozin as add-on to metformin, sulphonylurea, pioglitazone

Empagliflozin as add-on to metformin, metformin and a sulphonylurea, or pioglitazone and metformin resulted in statistically significant ($p < 0.0001$) reductions in HbA1c and body weight compared to placebo (Table 2). In addition it resulted in a clinically meaningful reduction in FPG, systolic and diastolic blood pressure compared to placebo.

In the double-blind placebo-controlled extension of these studies, reduction of HbA1c, body weight and blood pressure were sustained up to Week 76.

Table 2: Efficacy results of 24 week placebo-controlled studies

Add-on to metformin therapy^a			
	Placebo	Empagliflozin	
		10 mg	25 mg
N	207	217	213
HbA1c (%)			
Baseline (mean)	7.90	7.94	7.86
Change from baseline ¹	-0.13	-0.70	-0.77
Difference from placebo ¹ (97.5% CI)		-0.57* (-0.72, -0.42)	-0.64* (-0.79, -0.48)
N	184	199	191
Patients (%) achieving HbA1c <7% with baseline HbA1c ≥7%²	12.5	37.7	38.7
N	207	217	213
Body Weight (kg)			
Baseline (mean)	79.73	81.59	82.21
Change from baseline ¹	-0.45	-2.08	-2.46
Difference from		-1.63* (-2.17, -1.08)	-2.01* (-2.56, -1.46)

placebo ¹ (97.5% CI)			
N	207	217	213
SBP (mmHg)²			
Baseline (mean)	128.6	129.6	130.0
Change from baseline ¹	-0.4	-4.5	-5.2
Difference from placebo ¹ (95% CI)		-4.1* (-6.2, -2.1)	-4.8* (-6.9, -2.7)
Add-on to metformin and a sulphonylurea therapy^a			
	Placebo	Empagliflozin	
		10 mg	25 mg
N	225	225	216
HbA1c (%)			
Baseline (mean)	8.15	8.07	8.10
Change from baseline ¹	-0.17	-0.82	-0.77
Difference from placebo ¹ (97.5% CI)		-0.64* (-0.79, -0.49)	-0.59* (-0.74, -0.44)
N	216	209	202
Patients (%) achieving HbA1c <7% with baseline HbA1c ≥7%²	9.3	26.3	32.2
N	225	225	216
Body Weight (kg)			
Baseline (mean)	76.23	77.08	77.50
Change from baseline ¹	-0.39	-2.16	-2.39
Difference from placebo ¹ (97.5% CI)		-1.76* (-2.25, -1.28)	-1.99* (-2.48, -1.50)
N	225	225	216
SBP (mmHg)²			
Baseline (mean)	128.8	128.7	129.3
Change from baseline ¹	-1.4	-4.1	-3.5
Difference from placebo ¹ (95% CI)		-2.7 (-4.6, -0.8)	-2.1 (-4.0, -0.2)
Add-on to pioglitazone + metformin therapy^b			
	Placebo	Empagliflozin	
		10 mg	25 mg
N	124	125	127
HbA1c (%)			
Baseline (mean)	8.15	8.07	8.10
Change from baseline ¹	-0.11	-0.55	-0.70
Difference from placebo ¹ (97.5% CI)		-0.45* (-0.69, -0.21)	-0.60* (-0.83, -0.36)
N	118	116	123
Patients (%) achieving HbA1c <7% with baseline HbA1c ≥7%²	8.5	22.4	28.5
N	124	125	127
Body Weight (kg)			
Baseline (mean)	79.45	79.44	80.98

Change from baseline ¹	0.40	-1.74	-1.59
Difference from placebo ¹ (97.5% CI)		-2.14* (-2.93, -1.35)	-2.00* (-2.78, -1.21)
N	124	125	127
SBP (mmHg)^{2, 3}			
Baseline (mean)	125.5	126.3	126.3
Change from baseline ¹	0.8	-3.5	-3.3
Difference from placebo ¹ (95% CI)		-4.2** (-6.94, -1.53)	-4.1** (-6.76, -1.37)

^a Full analysis set (FAS) using last observation carried forward (LOCF) prior to glycaemic rescue therapy

^b Subgroup analysis for patients on additional background of metformin (FAS, LOCF)

¹ Mean adjusted for baseline value

² Not evaluated for statistical significance as a part of the sequential confirmatory testing procedure

³ LOCF, values after antihypertensive rescue censored

* p-value <0.0001

** p-value <0.01

Empagliflozin 24 months data, as add-on to metformin in comparison to glimepiride

In a study comparing the efficacy and safety of empagliflozin 25 mg versus glimepiride (up to 4 mg per day) in patients with inadequate glycaemic control on metformin alone, treatment with empagliflozin daily resulted in superior reduction in HbA1c (Table 3), and a clinically meaningful reduction in FPG, compared to glimepiride. Empagliflozin daily resulted in a statistically significant reduction in body weight, systolic and diastolic blood pressure and a statistically significantly lower proportion of patients with hypoglycaemic events compared to glimepiride (2.5% for empagliflozin, 24.2% for glimepiride, p<0.0001).

Table 3: Efficacy results at 104 week in an active controlled study comparing empagliflozin to glimepiride as add on to metformin^a

	Empagliflozin 25 mg	Glimepiride^b
N	765	780
HbA1c (%)		
Baseline (mean)	7.92	7.92
Change from baseline ¹	-0.66	-0.55
Difference from glimepiride ¹ (97.5% CI)	-0.11* (-0.20, -0.01)	
N	690	715
Patients (%) achieving HbA1c <7% with baseline HbA1c ≥7%²	33.6	30.9
N	765	780
Body Weight (kg)		
Baseline (mean)	82.52	83.03
Change from baseline ¹	-3.12	1.34
Difference from glimepiride ¹ (97.5% CI)	-4.46** (-4.87, -4.05)	
N	765	780
SBP (mmHg)³		
Baseline (mean)	133.4	133.5
Change from baseline ¹	-3.1	2.5
Difference from glimepiride ¹ (97.5% CI)	-5.6** (-7.0,-4.2)	

^a Full analysis set (FAS) using last observation carried forward (LOCF) prior to glycaemic rescue therapy

^b Up to 4 mg glimepiride

¹ Mean adjusted for baseline value

² Not evaluated for statistical significance as a part of the sequential confirmatory testing procedure

³ LOCF, values after antihypertensive rescue censored

* p-value <0.0001 for non-inferiority, and p-value = 0.0153 for superiority

** p-value <0.0001

Add-on to insulin therapy

Empagliflozin as add-on to multiple daily insulin

The efficacy and safety of empagliflozin as add-on to multiple daily insulin with concomitant metformin therapy was evaluated in a double-blind, placebo-controlled trial of 52 weeks duration. During the initial 18 weeks and the last 12 weeks, the insulin dose was kept stable, but was adjusted to achieve pre-prandial glucose levels <100 mg/dl [5.5 mmol/l], and post-prandial glucose levels

<140 mg/dl [7.8 mmol/l] between Weeks 19 and 40.

At Week 18, empagliflozin provided statistically significant improvement in HbA1c compared with placebo (Table 4).

At Week 52, treatment with empagliflozin resulted in a statistically significant decrease in HbA1c and insulin sparing compared with placebo and a reduction in body weight.

Table 4: Efficacy results at 18 and 52 weeks in a placebo-controlled study of empagliflozin as add-on to multiple daily doses of insulin with concomitant metformin therapy

	Placebo	empagliflozin	
		10 mg	25 mg
N	135	128	137
HbA1c (%) at week 18^a			
Baseline (mean)	8.29	8.42	8.29
Change from baseline ¹	-0.58	-0.99	-1.03
Difference from placebo ¹ (97.5% CI)		-0.41* (-0.61, -0.21)	-0.45* (-0.65, -0.25)
N	86	84	87
HbA1c (%) at week 52^b			
Baseline (mean)	8.26	8.43	8.38
Change from baseline ¹	-0.86	-1.23	-1.31
Difference from placebo ¹ (97.5% CI)		-0.37** (-0.67, -0.08)	-0.45* (-0.74, -0.16)
N	84	84	87
Patients (%) achieving HbA1c <7% with baseline HbA1c ≥7% at week 52^{b, 2}	27.4	41.7	48.3
N	86	83	86
Insulin dose (IU/day) at week 52^{b, 3}			
Baseline (mean)	91.01	91.77	90.22
Change from baseline ¹	12.84	0.22	-2.25

Difference from placebo ¹ (97.5% CI)		-12.61** (-21.43, -3.80)	-15.09** (-23.79, -6.40)
N	86	84	87
Body Weight (kg) at week 52^b			
Baseline (mean)	97.78	98.86	94.93
Change from baseline ¹	0.42	-2.47	-1.94
Difference from placebo ¹ (97.5% CI)		-2.89* (-4.29, -1.49)	-2.37* (-3.75, -0.98)

^a Subgroup analysis for patients on additional background of metformin (FAS, LOCF)

^b Subgroup analysis for patients on additional background of metformin (PPS-Completers, LOCF)

¹ Mean adjusted for baseline value

² not evaluated for statistical significance as a part of the sequential confirmatory testing procedure

³ Week 19-40: treat-to-target regimen for insulin dose adjustment to achieve pre-defined glucose target levels (pre-prandial <100 mg/dl (5.5 mmol/l), post-prandial <140 mg/dl (7.8 mmol/l))

* p-value ≤0.0005

** p-value <0.005

Empagliflozin as add on to basal insulin

The efficacy and safety of empagliflozin as add on to basal insulin with concomitant metformin therapy was evaluated in a double-blind, placebo-controlled trial of 78 weeks duration. During the initial 18 weeks the insulin dose was kept stable, but was adjusted to achieve a FPG <110 mg/dl in the following 60 weeks.

At week 18, empagliflozin provided statistically significant improvement in HbA1c. A greater proportion of patients treated with empagliflozin and with a baseline HbA1c ≥7.0% achieved a target HbA1c of <7% compared to placebo (Table 5).

At 78 weeks, the decrease in HbA1c and insulin sparing effect of empagliflozin was maintained. Furthermore, empagliflozin resulted in a reduction in FPG, body weight and blood pressure.

Table 5 Efficacy results at 18 and 78 weeks in a placebo-controlled study of empagliflozin as add on to basal insulin with metformin^a

	Placebo	Empagliflozin 10 mg	Empagliflozin 25 mg
N	96	107	99
HbA1c (%) at week 18			
Baseline (mean)	8.02	8.21	8.35
Change from baseline ¹	-0.09	-0.62	-0.72
Difference from placebo ¹ (97.5% CI)		-0.54* (-0.77, -0.30)	-0.63* (-0.88, -0.39)
N	89	105	94
HbA1c (%) at week 78			
Baseline (mean)	8.03	8.24	8.29
Change from baseline ¹	-0.08	-0.42	-0.71
Difference from placebo ¹ (97.5% CI)		-0.34** (-0.64, -0.05)	-0.63* (-0.93, -0.33)
N	89	105	94

Basal insulin dose (IU/day) at week 78			
Baseline (mean)	49.61	47.25	49.37
Change from baseline ¹	4.14	-2.07	-0.28
Difference from placebo ¹ (97.5% CI)		-6.21** (-11.81, -0.61)	-4.42 (-10.18, 1.34)

^a Subgroup analysis of full analysis set (FAS) for patients on additional background of metformin - Completers using last observation carried forward (LOCF) prior to glycaemic rescue therapy

¹ mean adjusted for baseline value

* p-value <0.0001

** p-value ≤0.025

Empagliflozin and linagliptin as add-on therapy to metformin

In a double-blind trial in patients with inadequate glycaemic control, 24-weeks treatment with both doses of empagliflozin plus linagliptin as add-on to metformin therapy provided statistically significant (p<0.0001) reductions in HbA1c (change from baseline of -1.08% for empagliflozin 10 mg plus linagliptin 5 mg, -1.19% for empagliflozin 25 mg plus linagliptin 5 mg, -0.70% for linagliptin

5 mg). Compared to linagliptin 5 mg, both doses of empagliflozin plus linagliptin 5 mg provided statistically significant reductions in FPG and blood pressure. Both doses provided similar statistically significant reductions in body weight, expressed as kg and percentage change. A greater proportion of patients with a baseline HbA1c ≥7.0% and treated with empagliflozin plus linagliptin achieved a target HbA1c of <7% compared to linagliptin 5 mg. Clinically meaningful reductions in HbA1c were maintained for 52 weeks.

Empagliflozin twice daily versus once daily as add on to metformin therapy

The efficacy and safety of empagliflozin twice daily versus once daily (daily dose of 10 mg and

25 mg) as add-on therapy in patients with in sufficient glycaemic control on metformin monotherapy was evaluated in a double blind placebo-controlled study of 16 weeks duration. All treatments with empagliflozin resulted in significant reductions in HbA1c from baseline (total mean 7.8%) after 16 weeks of treatment compared with placebo. Empagliflozin twice daily dose regimens on a background of metformin led to comparable reductions in HbA1c versus once daily dose regimens with a treatment difference in HbA1c reductions from baseline to week 16 of -0.02% (95% CI -0.16, 0.13)

for empagliflozin 5 mg twice daily versus 10 mg once daily, and -0.11% (95% CI -0.26, 0.03) for empagliflozin 12.5 mg twice daily versus 25 mg once daily.

Cardiovascular safety

In a prospective, pre-specified meta-analysis of independently adjudicated cardiovascular events from 12 phase 2 and 3 clinical studies involving 10,036 patients with type 2 diabetes, empagliflozin did not increase cardiovascular risk.

2 hour post-prandial glucose

Treatment with empagliflozin as add-on to metformin or metformin plus sulfonylurea resulted in clinically meaningful improvement of 2-hour post-prandial glucose (meal tolerance test) at 24 weeks (add-on to metformin, placebo: +5.9 mg/dl, empagliflozin 10 mg: -46.0 mg/dl, empagliflozin

25 mg: -44.6 mg/dl; add-on to metformin plus sulphonylurea, placebo: -2.3 mg/dl, empagliflozin 10 mg: -35.7 mg/dl, empagliflozin 25 mg: -36.6 mg/dl).

Patients with baseline HbA1c \geq 9%

In a pre-specified analysis of subjects with baseline HbA1c \geq 9.0%, treatment with empagliflozin 10 mg or 25 mg as add-on to metformin resulted in statistically significant reductions in HbA1c at Week 24 (adjusted mean change from baseline of -1.49% for empagliflozin 25 mg, -1.40% for empagliflozin 10 mg, and -0.44% for placebo).

Body weight

In a pre-specified pooled analysis of 4 placebo controlled studies, treatment with empagliflozin (68% of all patients were on metformin background) resulted in body weight reduction compared to placebo at week 24 (-2.04 kg for empagliflozin 10 mg, -2.26 kg for empagliflozin 25 mg and -0.24 kg for placebo) that was maintained up to week 52 (-1.96 kg for empagliflozin 10 mg, -2.25 kg for empagliflozin 25 mg and -0.16 kg for placebo).

Blood pressure

The efficacy and safety of empagliflozin was evaluated in a double-blind, placebo controlled study of 12 weeks duration in patients with type 2 diabetes and high blood pressure on different antidiabetic and up to 2 antihypertensive therapies. Treatment with empagliflozin once daily resulted in statistically significant improvement in HbA1c, and 24 hour mean systolic and diastolic blood pressure as determined by ambulatory blood pressure monitoring (Table 6). Treatment with empagliflozin provided reductions in seated SBP and DBP.

Table 6 Efficacy results at 12 week in a placebo-controlled study of empagliflozin in patients with type 2 diabetes and uncontrolled blood pressure^a

	Placebo	empagliflozin	
		10 mg	25 mg
N	271	276	276
HbA1c (%) at week 12¹			
Baseline (mean)	7.90	7.87	7.92
Change from baseline ²	0.03	-0.59	-0.62
Difference from placebo ¹ (95% CI) ²		-0.62* (-0.72, -0.52)	-0.65* (-0.75, -0.55)
24 hour SBP at week 12³			
Baseline (mean)	131.72	131.34	131.18
Change from baseline ⁴	0.48	-2.95	-3.68
Difference from placebo ⁴ (95% CI)		-3.44* (-4.78, -2.09)	-4.16* (-5.50, -2.83)
24 hour DBP at week 12³			
Baseline (mean)	75.16	75.13	74.64
Change from baseline ⁵	0.32	-1.04	-1.40
Difference from placebo ⁵ (95% CI)		-1.36** (-2.15, -0.56)	-1.72* (-2.51, -0.93)

^a Full analysis set (FAS)

¹ LOCF, values after taking antidiabetic rescue therapy censored

² Mean adjusted for baseline HbA1c, baseline eGFR, geographical region and number of antihypertensive medicinal products

³ LOCF, values after taking antidiabetic rescue therapy or changing antihypertensive rescue therapy censored

⁴ Mean adjusted for baseline SBP, baseline HbA1c, baseline eGFR, geographical region and number of antihypertensive medicinal products

⁵ Mean adjusted for baseline DBP, baseline HbA1c, baseline eGFR, geographical region and number of antihypertensive medicinal products

* p-value <0.0001

** p-value <0.001

In a pre-specified pooled analysis of 4 placebo-controlled studies, treatment with empagliflozin (68% of all patients were on metformin background) resulted in a reduction in systolic blood pressure (empagliflozin 10 mg: -3.9 mmHg, empagliflozin 25 mg: -4.3 mmHg) compared with placebo

(-0.5 mmHg), and in diastolic blood pressure (empagliflozin 10 mg: -1.8 mmHg, empagliflozin 25 mg: -2.0 mmHg) compared with placebo (-0.5 mmHg), at week 24, that were maintained up to week 52.

Metformin

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 sulphonylurea and insulin monotherapy groups (40.1 events/1,000 patient-years), p=0.0034,
- a significant reduction of the absolute risk of any 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 sulphonylurea 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).

Paediatric population

The European Medicines Agency has waived the obligation to submit the results of studies with This drug product in all subsets of the paediatric population in type 2 diabetes (see section 4.2 for information on paediatric use).

5.2 Pharmacokinetic properties

This drug product

The results of bioequivalence studies in healthy subjects demonstrated that This drug product (empagliflozin/metformin hydrochloride) 5 mg/850 mg, 5 mg/1,000 mg, 12.5 mg/850 mg, and

12.5 mg/1,000 mg combination tablets are bioequivalent to co-administration of corresponding doses of empagliflozin and metformin as individual tablets.

Administration of empagliflozin/metformin 12.5 mg/1,000 mg under fed conditions resulted in 9% decrease in AUC and a 28% decrease in C_{max} for empagliflozin, when compared to fasted conditions. For metformin, AUC decreased by 12% and C_{max} decreased by 26% compared to fasting conditions. The observed effect of food on empagliflozin and metformin

is not considered to be clinically relevant. However, as metformin is recommended to be given with meals, This drug product is also proposed to be given with food.

The following statements reflect the pharmacokinetic properties of the individual active substances of This drug product.

Empagliflozin

Absorption

The pharmacokinetics of empagliflozin have been extensively characterised in healthy volunteers and patients with type 2 diabetes. After oral administration, empagliflozin was rapidly absorbed with peak plasma concentrations occurring at a median t_{max} of 1.5 hours post-dose. Thereafter, plasma concentrations declined in a biphasic manner with a rapid distribution phase and a relatively slow terminal phase. The steady state mean plasma AUC and C_{max} were 1870 nmol.h and 259 nmol/l with empagliflozin 10 mg and 4740 nmol.h and 687 nmol/l with empagliflozin 25 mg once daily. Systemic exposure of empagliflozin increased in a dose-proportional manner. The single-dose and steady-state pharmacokinetic parameters of empagliflozin were similar suggesting linear pharmacokinetics with respect to time. There were no clinically relevant differences in empagliflozin pharmacokinetics between healthy volunteers and patients with type 2 diabetes.

The pharmacokinetics of 5 mg empagliflozin twice daily and 10 mg empagliflozin once daily were compared in healthy subjects. Overall exposure (AUC_{ss}) of empagliflozin over a 24-hour period with empagliflozin 5 mg administered twice daily was similar to empagliflozin 10 mg administered once daily. As expected, empagliflozin 5 mg administered twice daily compared with 10 mg empagliflozin once daily resulted in lower C_{max} and higher trough plasma empagliflozin concentrations (C_{min}).

Administration of empagliflozin 25 mg after intake of a high-fat and high calorie meal resulted in slightly lower exposure; AUC decreased by approximately 16% and C_{max} by approximately 37% compared to fasted condition. The observed effect of food on empagliflozin pharmacokinetics was not considered clinically relevant and empagliflozin may be administered with or without food. Similar results were obtained when This drug product (empagliflozin/metformin) combination tablets were administered with high-fat and high calorie meal.

Distribution

The apparent steady-state volume of distribution was estimated to be 73.8 l based on the population pharmacokinetic analysis. Following administration of an oral [^{14}C]-empagliflozin solution to healthy volunteers, the red blood cell partitioning was approximately 37% and plasma protein binding was 86%.

Biotransformation

No major metabolites of empagliflozin were detected in human plasma, as defined by at least 10% of total drug-related material, and the most abundant metabolites were three glucuronide conjugates (2-, 3-, and 6-O-glucuronide). *In vitro* studies suggested that the primary route of metabolism of empagliflozin in humans is glucuronidation by the uridine 5'-diphospho-glucuronosyltransferases UGT2B7, UGT1A3, UGT1A8, and UGT1A9.

Elimination

Based on the population pharmacokinetic analysis, the apparent terminal elimination half-life of empagliflozin was estimated to be 12.4 hours and apparent oral clearance was 10.6 l/hour.

The inter-subject and residual variabilities for empagliflozin oral clearance were 39.1% and 35.8%, respectively. With once-daily dosing, steady-state plasma concentrations of empagliflozin were reached by the fifth dose. Consistent with the half-life, up to 22% accumulation, with respect to plasma AUC, was observed at steady-state. Following administration of an oral [¹⁴C]-empagliflozin solution to healthy volunteers, approximately 96% of the drug-related radioactivity was eliminated in faeces (41%) or urine (54%). The majority of drug-related radioactivity recovered in faeces was unchanged parent drug and approximately half of drug-related radioactivity excreted in urine was unchanged parent drug.

Special populations

Renal impairment

In patients with mild, moderate or severe renal impairment (creatinine clearance <30 - <90 ml/min) and patients with kidney failure/end stage renal disease (ESRD), AUC of empagliflozin increased by approximately 18%, 20%, 66%, and 48%, respectively compared to subjects with normal renal function. Peak plasma levels of empagliflozin were similar in subjects with moderate renal impairment and kidney failure/ESRD compared to patients with normal renal function. Peak plasma levels of empagliflozin were roughly 20% higher in subjects with mild and severe renal impairment as compared to subjects with normal renal function. The population pharmacokinetic analysis showed that the apparent oral clearance of empagliflozin decreased with a decrease in creatinine clearance leading to an increase in drug exposure.

Hepatic impairment

In subjects with mild, moderate, and severe hepatic impairment according to the Child-Pugh classification, AUC of empagliflozin increased approximately by 23%, 47%, and 75% and C_{max} by approximately 4%, 23%, and 48%, respectively, compared to subjects with normal hepatic function.

Body Mass Index

Body mass index had no clinically relevant effect on the pharmacokinetics of empagliflozin based on the population pharmacokinetic analysis. In this analysis, AUC was estimated to be 5.82%, 10.4%, and 17.3% lower in subjects with BMI of 30, 35, and 45 kg/m², respectively, compared to subjects with a body mass index of 25 kg/m².

Gender

Gender had no clinically relevant effect on the pharmacokinetics of empagliflozin based on the population pharmacokinetic analysis.

Race

In the population pharmacokinetic analysis, AUC was estimated to be 13.5% higher in Asians with a body mass index of 25 kg/m² compared to non-Asians with a body mass index of 25 kg/m².

Elderly

Age did not have a clinically meaningful impact on the pharmacokinetics of empagliflozin based on the population pharmacokinetic analysis.

Paediatric population

Studies characterising the pharmacokinetics of empagliflozin in paediatric patients have not been performed.

Metformin

Absorption

After an oral dose of metformin, t_{max} is reached in 2.5 hours. Absolute bioavailability of a 500 mg or 850 mg metformin hydrochloride 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 recommended metformin doses and dosing schedules, steady-state plasma concentrations are reached within 24 to 48 hours and are generally less than 1 microgram/ml. In controlled clinical trials, maximum metformin plasma levels (C_{max}) did not exceed 5 microgram/ml, even at maximum doses.

Food decreases the extent and slightly delays the absorption of metformin. Following administration of a dose of 850 mg metformin hydrochloride, a 40% lower plasma peak concentration, a 25% decrease in AUC and a 35 minute prolongation of the 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 volume of distribution (V_d) ranged between 63 - 276 l.

Biotransformation

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.

Special populations

Paediatric population

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

Multiple-dose study: After repeated doses of 500 mg twice daily for 7 days in paediatric patients the peak plasma concentration (C_{max}) and systemic exposure (AUC_{0-t}) were approximately 33% and 40% lower, respectively, compared to diabetic adults who received repeated doses of 500 mg twice daily for 14 days. As the dose is individually titrated based on glycaemic control, this is of limited clinical relevance.

5.3 Preclinical safety data

Empagliflozin and metformin

General toxicity studies in rats of up to 13 weeks were performed with the combination of empagliflozin and metformin and did not reveal any additional target organs when compared to empagliflozin or metformin alone. Some responses were increased by the combination treatment, such as effects on renal physiology, electrolyte balance and acid/base state. However, only hypochloremia was considered adverse at exposures of approximately 9- and 3-times the clinical AUC exposure of the maximum recommended dose of empagliflozin and metformin, respectively.

An embryofetal development study in pregnant rats did not indicate a teratogenic effect attributed to the co-administration of empagliflozin and metformin at exposures of approximately 14-times the clinical AUC exposure of empagliflozin associated with the highest dose, and 4-times the clinical AUC exposure of metformin associated with the 2000 mg dose.

Empagliflozin

Non-clinical data reveal no special hazard for humans based on conventional studies of safety pharmacology, genotoxicity, fertility and early embryonic development.

In long term toxicity studies in rodents and dogs, signs of toxicity were observed at exposures greater than or equal to 10-times the clinical dose of empagliflozin. Most toxicity was consistent with secondary pharmacology related to urinary glucose loss and electrolyte imbalances including decreased body weight and body fat, increased food consumption, diarrhoea, dehydration, decreased serum glucose and increases in other serum parameters reflective of increased protein metabolism and gluconeogenesis, urinary changes such as polyuria and glucosuria, and microscopic changes including mineralisation in kidney and some soft and vascular tissues. Microscopic evidence of the effects of exaggerated pharmacology on the kidney observed in some species included tubular dilatation, and tubular and pelvic mineralisation at approximately 4-times the clinical AUC exposure of empagliflozin associated with the 25 mg dose.

Empagliflozin is not genotoxic.

In a 2 year carcinogenicity study, empagliflozin did not increase the incidence of tumours in female rats up to the highest dose of 700 mg/kg/day, which corresponds to approximately 72-times the maximal clinical AUC exposure to empagliflozin. In male rats, treatment-related benign vascular proliferative lesions (haemangiomas) of the mesenteric lymph node were observed at the highest dose, but not at 300 mg/kg/day, which corresponds to approximately 26-times the maximal clinical exposure to empagliflozin. Interstitial cell tumours in the testes were observed with a higher incidence in rats at 300 mg/kg/day and above, but not at 100 mg/kg/day which corresponds to approximately 18-times the maximal clinical exposure to empagliflozin. Both tumours are common in rats and are unlikely to be relevant to humans. Empagliflozin did not increase the incidence of tumours in female mice at doses up to 1,000 mg/kg/day, which corresponds to approximately 62-times the maximal clinical exposure to empagliflozin. Empagliflozin induced renal tumours in male mice at 1,000 mg/kg/day, but not at 300 mg/kg/day, which corresponds to approximately 11-times the maximal clinical exposure to

empagliflozin. The mode of action for these tumours is dependent on the natural predisposition of the male mouse to renal pathology and a metabolic pathway not reflective of humans. The male mouse renal tumours are considered not relevant to humans. At exposures sufficiently in excess of exposure in humans after therapeutic doses, empagliflozin had no adverse effects on fertility or early embryonic development. Empagliflozin administered during the period of organogenesis was not teratogenic. Only at maternally toxic doses, empagliflozin also caused bent limb bones in the rat and increased embryofetal loss in the rabbit.

In pre- and postnatal toxicity studies in rats, reduced weight gain of offspring was observed at maternal exposures approximately 4-times the maximal clinical exposure to empagliflozin. No such effect was seen at systemic exposure equal to the maximal clinical exposure to empagliflozin. The relevance of this finding to humans is unclear.

In a juvenile toxicity study in the rat, when empagliflozin was administered from postnatal day 21 until postnatal day 90, non-adverse, minimal to mild renal tubular and pelvic dilation in juvenile rats was seen only at 100 mg/kg/day, which approximates 11-times the maximum clinical dose of 25 mg. These findings were absent after a 13 weeks drug-free recovery period.

Metformin

Preclinical data for metformin reveal no special hazard for humans based on conventional studies of safety pharmacology, repeated dose toxicity, genotoxicity, or carcinogenic potential or reproductive toxicity. At dose levels of 500 mg/kg/day administered to Wistar Hannover rats, associated with 7-times the maximum recommended human dose (MRHD) of metformin, teratogenicity of metformin was observed, mostly evident as an increase in the number of skeletal malformations.

6. PHARMACEUTICAL PARTICULARS

6.1 List of excipients

Tablet core

Maize starch

Plasdone S630

Aerosil 200 (Silicon Dioxide)

Magnesium Stearate

Film-coating

Hydroxy Propyl Methyl Cellulose (Pharmacoat 606)

Titanium Dioxide

Purified Talc

Polyethylene Glycol-6000

6.2 Incompatibilities

Not applicable.

6.3 Shelf life

24 months

6.4 Special precautions for storage

Store below 30°C. Protect from sunlight and moisture.

6.5 Nature and contents of container

Blister pack of printed aluminium foil with cold forming foil packed in printed carton along with leaflet / 14's & 28's per pack.

Pack sizes of 1 x 14 and 28 (2 x 14) film coated tablets.

6.6 Special precautions for disposal

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

7. MARKETING AUTHORISATION HOLDER

Marketing authorization holder and Manufacturing site address:

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Plot 13-14, Sector 15, Korangi Industrial Area, Karachi,

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8. MARKETING AUTHORISATION NUMBER(S)

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9. DATE OF FIRST AUTHORISATION/RENEWAL OF THE AUTHORISATION

12-02-2024

10. DATE OF REVISION OF THE TEXT

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