

## New Zealand Datasheet

### Name of Medicine

GlucaGen<sup>®</sup> HypoKit

Glucagon (rys) hydrochloride.

### Presentation

White crystalline powder (which may appear more like a powdery tablet upon settling) and clear colourless solvent for solution for injection. After reconstitution of glucagon with the solvent (Sterilised Water for Injections), each syringe contains glucagon 1 mg/ml and lactose monohydrate 107 mg/ml.

Glucagon is a polypeptide hormone consisting of 29 amino acids in a single chain. Glucagon (rys) hydrochloride is synthesised by genetic engineering from yeast (*Saccharomyces cerevisiae*) and has the same amino acid sequence as natural human glucagon.

### Uses

#### Actions

Pharmacotherapeutic group: H 04 AA 01.

Glucagon is a hyperglycaemic agent that mobilises hepatic glycogen which is released into the blood as glucose. Glucagon is only of benefit when liver glycogen is present. For that reason, glucagon has little or no effect when the patient has been fasting for a prolonged period, or is suffering from adrenal insufficiency, chronic hypoglycaemia or alcohol-induced hypoglycaemia. Glucagon, unlike adrenaline, has no effect upon muscle phosphorylase and therefore cannot assist in the transfer of carbohydrate from the much larger stores of glycogen that are present in the skeletal muscle. Glucagon stimulates the release of catecholamines. In the presence of phaeocromocytoma, glucagon can cause the tumour to release large amounts of catecholamines which will cause an acute hypertensive reaction.

Glucagon inhibits the tone and motility of the smooth muscle in the gastrointestinal tract.

Glucagon stimulates the production of insulin by the pancreatic beta cells and can, therefore, be used diagnostically in a C-peptide test to estimate residual  $\beta$ -cell capacity.

The onset of inhibitory effect on gastrointestinal motility occurs within 5 – 15 minutes after an intramuscular injection, with a duration of 10 – 40 minutes depending on dose and on the organ under examination. Onset of effect occurs within 1 minute after intravenous injection. Duration of action is in the range 5 – 20 minutes depending on dose and organ.

When used in the treatment of severe hypoglycaemia, an effect on blood glucose is usually seen within 10 minutes.

#### Pharmacokinetics

##### Metabolism

The metabolism of exogenous glucagon is identical to that of endogenous glucagon which is as follows:

Glucagon is secreted by the alpha cells in the pancreatic Islets of Langerhans and transported via the portal circulation to the liver where the major portion is bound. From the liver it is excreted into the bile. The lesser portion of glucagon, that is not bound in the liver, is distributed to the other organs in the body, particularly the kidneys which have a high

binding capacity for it. It is degraded enzymatically in blood plasma and in the organs to which it is distributed.

### *Elimination*

The liver and kidney are major sites of glucagon clearance, each contributing about 30% to the overall metabolic clearance rate. Metabolic clearance rate of glucagon in humans is approximately 10 ml/kg/min. Glucagon has a short half-life in the blood of about 3-6 minutes.

## **Indications**

### Therapeutic

Treatment of severe hypoglycaemic reactions, which may occur in the management of diabetic patients receiving insulin or oral hypoglycaemic agents.

To prevent the occurrence of secondary hypoglycaemia, oral carbohydrate should be given to restore the hepatic glycogen when the patient has responded to the treatment.

The mechanism and hence treatment of sulfonylurea-induced hypoglycaemia differs from that of severe insulin-induced hypoglycaemia in some important ways. Consciousness should preferably be restored by the administration of intravenous glucose. If glucagon is used due to the unavailability of intravenous glucose (e.g. before reaching a hospital) care should be taken to protect against secondary hypoglycaemia with constant monitoring of the patient's blood sugar level by medical personnel. Subsequent administration of intravenous glucose may be required.

### Diagnostic

Motility inhibitor in examinations of the gastrointestinal tract in adults, e.g. double contrast radiography and endoscopy.

## **Dosage and Administration**

Before reconstitution the powder should be a white or nearly white powder (which may appear more like a powdery tablet upon settling). The solvent should be clear and colourless without particles.

The freeze dried glucagon should be dissolved in the accompanying diluent. Inject the water for injections (1.1 mL) into the vial containing the freeze-dried glucagon. Gently shake the vial until the glucagon is completely dissolved and the solution is clear. Withdraw the solution back into the syringe. The reconstituted solution appears clear and colourless, and forms an injection of 1 mg (1 IU) per mL to be administered subcutaneously, intramuscularly or intravenously.

### **Severe Hypoglycaemia**

For adults and children above 25 kg, the full dose (corresponding to 1 mg glucagon) should be injected. For children below 25 kg, inject half the amount (corresponding to 0.5 mg).

### **Administration by medical personnel**

Administer 0.5 to 1 mg of glucagon by subcutaneous, intramuscular or intravenous injection. The patient will normally respond within 10 minutes. When the patient has responded to treatment, give oral carbohydrate to restore the liver glycogen and to prevent secondary hypoglycaemia. If the patient does not respond within 10 minutes, intravenous glucose should be given.

### **Administration by non-medical personnel**

Administer 0.5 to 1.0 mg of glucagon by subcutaneous or intramuscular injection into the thigh or buttocks or upper arm.. The patient will normally respond within 10 minutes to the

glucagon injection, and oral carbohydrate should be given to restore the liver glycogen and prevent secondary hypoglycaemia. Medical assistance *must be sought for all unconscious patients*. Always notify the physician if glucagon has been used, as an adjustment in anti-diabetic therapy may be required.

### **Diagnostic Indications**

Note that a syringe with a thinner needle and a finer graduation than that supplied in GlucaGen HypoKit may be more suitable for use in diagnostic procedures.

#### *Inhibition of gastrointestinal motility*

GlucaGen HypoKit must be administered by medical persons. Onset of action after an intravenous injection of 0.2-0.5 mg occurs within one minute and the duration of effect is between 5 and 20 minutes depending on the organ under examination. The onset of action after an intramuscular injection of 1–2 mg occurs after 5-15 minutes, lasting for 10-40 minutes depending on the organ.

At the end of the diagnostic procedure oral carbohydrate should be given to patients who have been fasting, assuming this is compatible with the diagnostic procedure performed.

Doses range from 0.2 to 2 mg depending on the diagnostic technique used and the route of administration. The usual diagnostic dose for relaxation of the stomach, duodenal bulb, duodenum and small bowel is 0.2-0.5 mg given intravenously or 1 mg given intramuscularly. The usual dose to relax the colon is 0.5-0.75 mg intravenously or 1-2 mg intramuscularly.

### **Contraindications**

- Phaeochromocytoma (glucagon can provoke a release of catecholamine resulting in sudden and severe hypertension)
- Insulinoma (after an initial rise in blood glucose, hypoglycaemia may be exacerbated by glucagon-induced insulin secretion)
- Glucagonoma
- Hypersensitivity to glucagon or any of the excipients

### **Warnings and Precautions**

Hepatic glycogen is required for glucagon to be of benefit in hypoglycaemia. Glucagon will have little or no effect when the patient is fasting or is suffering from adrenal insufficiency, chronic hypoglycaemia or alcohol induced hypoglycaemia

Persons who have been given glucagon in connection with diagnostic procedures may experience discomfort, in particular if they have been fasting. Nausea, hypoglycaemia and blood pressure changes have been reported in these situations. After the end of a diagnostic procedure oral carbohydrates should be given to patients who have been fasting, assuming this is compatible with the diagnostic procedure applied. If fasting is needed post-examination or in case of severe hypoglycaemia, intravenous glucose may be required.

It should be borne in mind that glucagon is an insulin antagonist. Caution should be observed with regard to rebound hypoglycaemia if glucagon is used in patients with insulinoma (after an initial rise in blood glucose, hypoglycaemia may be exacerbated by glucagon-induced insulin secretion) or glucagonoma.

In regard to use in endoscopy or radiography, caution should be observed when glucagon is used in diabetic patients or in elderly patients with known cardiac disease.

Due to the instability of GlucaGen in solution, GlucaGen HypoKit should be used immediately after reconstitution and must not be administered by intravenous infusion.

The tip cap of the syringe included in the GlucaGen HypoKit contains natural rubber latex which may cause allergic reactions in latex sensitive individuals.

### **Use in Pregnancy**

Reproduction studies have not been performed in animals. Glucagon does not cross the human placenta barrier. The use of glucagon has been reported in pregnant women with diabetes and no harmful effects are known with respect to the course of pregnancy and the health of the unborn and the neonate.

### **Use in Lactation**

Glucagon is cleared from the bloodstream very fast (mainly by the liver,  $t_{1/2}$  = 3-6 min.), therefore the amount excreted in the milk of nursing mothers following conventional treatment (1 mg on rare occasions) will be extremely small. As glucagon is degraded in the digestive tract and cannot be absorbed in its intact form, it will not exert any metabolic effect in the child.

### **Effects on Ability to Drive and Use Machines**

No studies on the effects on the ability to drive and use machines have been performed. After diagnostic procedures, hypoglycaemia has been reported infrequently. Therefore driving a vehicle should be avoided until the patient has had a meal with oral carbohydrates.

### **Paediatric use**

GlucaGen can be used for the treatment of severe hypoglycaemia in children and adolescents.

The safety and efficacy of GlucaGen for inhibition of gastrointestinal motility in children and adolescents have not been established. No data are available.

### **Adverse Effects**

Frequencies of undesirable effects considered related to GlucaGen treatment and observed during clinical trials and or post marketing surveillance are presented below. Undesirable effects which have not been observed in clinical trials, but have been reported spontaneously are presented as "very rare".

During marketed use reporting of adverse drug reactions is very rare ( $\leq 1/10,000$ ). However, post-marketing experience is subject to under-reporting and this reporting rate should be interpreted in that light. The estimated number of treatment episodes is 46.9 million over a 16 year period.

### **Therapeutic indication**

<i>System organ class</i>	<i>Subject incidence</i>	<i>Adverse drug reaction</i>
Immune system disorders	Very rare $\leq 1/10,000$	Hypersensitivity reactions including anaphylactic reaction
Gastrointestinal disorders	Common $> 1/100$ and $\leq 1/10$ Uncommon $> 1/1000$ and $\leq 1/100$ Rare $> 1/10,000$ and $\leq 1/1000$	Nausea Vomiting Abdominal pain

## Diagnostic indication

<i>System organ class</i>	<i>Subject incidence</i>	<i>Adverse drug reaction</i>
Immune system disorders	Very rare $\leq 1/10,000$	Hypersensitivity reactions including anaphylactic reaction
Metabolism and nutrition disorders	Uncommon $> 1/1,000$ , and $\leq 1/100$ Very rare $\leq 1/10,000$	Hypoglycaemia <sup>1</sup> Hypoglycaemic coma
Cardiac disorders	Very rare $\leq 1/10,000$ Very rare $\leq 1/10,000$	Bradycardia <sup>2</sup> Tachycardia <sup>2</sup>
Vascular disorders	Very rare $\leq 1/10,000$ Very rare $\leq 1/10,000$	Hypotension <sup>2</sup> Hypertension <sup>2</sup>
Gastrointestinal disorders	Common $> 1/100$ and $\leq 1/10$ Uncommon $> 1/1,000$ and $\leq 1/100$ Rare $> 1/10,000$ and $\leq 1/1,000$	Nausea Vomiting Abdominal pain

<sup>1</sup> After a diagnostic procedure it can be more pronounced in patients having fasted (see 'Warnings and Precautions').

<sup>2</sup> Cardiovascular adverse events have only been reported when GlucaGen HypoKit is used as an adjunct in endoscopic or radiographic procedures.

## Interactions

Insulin reacts antagonistically towards glucagon.

Indomethacin: Glucagon may lose its ability to raise blood glucose or paradoxically may even produce hypoglycaemia

Glucagon has a positive inotropic action which can reverse the cardiovascular depression of profound  $\beta$  blockade. Patients taking beta-blockers might be expected to have a greater increase in both pulse and blood pressure, which might be expected to be temporary due to glucagon's short half-life. The increase in blood pressure and pulse rate may require therapy in patients with coronary artery disease.

Glucagon may potentiate the anticoagulant activity of warfarin when administered at supra-physiological doses much greater than that required for treatment of hypoglycaemia.

## Overdosage

Glucagon is a safe drug and overdosage would not normally pose a significant danger. Nausea and vomiting would be expected and should be managed by general supportive measures. Due to the positive inotropic and chronotropic actions of glucagon, patients on  $\beta$ -blockers may experience a transient rise in blood pressure. At large doses (in excess of those recommended for normal clinical use) hypokalaemia may occur, and should be monitored and corrected, if needed.

## Pharmaceutical Precautions

The sealed container should be protected from light and stored at a temperature not exceeding 25°C. Freezing should be avoided.

The reconstituted GlucaGen should be used immediately after preparation. If in rare cases it shows any signs of fibril formation (viscous appearance) or insoluble matter it should be discarded. Any portion of the solution remaining after use should be discarded.

## Medicine Classification

Pharmacist-Only Medicine

## Package Quantities

GlucaGen HypoKit is powder and solvent for solution for injection. The powder may appear

more like a powdery tablet upon settling.

GlucaGen HypoKit is packed in a plastic case and consists of a vial containing lyophilised glucagon (rys) 1 mg (1 IU) as hydrochloride and a glass syringe pre-filled with 1 mL water for injections. The powder vial is made of glass type I, Ph. Eur., is closed with a bromobutyl stopper, and is covered with an aluminium cap and a tamperproof plastic cap (the latter must be removed before use.) The pre-filled syringe (with needle) is made of glass type I, Ph. Eur. and contains a bromobutyl plunger.

## **Further Information**

### **Incompatibilities**

Not applicable.

### **Instructions for use/handling**

Reconstitution

Inject the Sterilised Water for Injections (1.1 ml) into the vial containing the freeze-dried glucagon. Shake the vial gently until the glucagon is completely dissolved and the solution is clear. Withdraw the solution back into the syringe.

The reconstituted solution forms an injection of 1 mg (1 IU) per ml to be administered subcutaneously or intramuscularly.

### **List of excipients**

Lactose Monohydrate.

Hydrochloric acid (pH adjustment).

Sodium hydroxide (pH adjustment).

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