

PRODUCT MONOGRAPH
INCLUDING PATIENT MEDICATION INFORMATION

PrREPLAGAL®

agalsidase alfa for injection

1 mg/mL Concentrate for solution for intravenous infusion

Enzyme Replacement Therapy

REPLAGAL, indicated for:

- the long-term enzyme replacement therapy in patients with a confirmed diagnosis of Fabry Disease (α -galactosidase A deficiency)

has been issued marketing authorization with conditions, pending the results of a trial to verify its clinical benefit. Patients should be advised of the nature of the authorization. For further information for REPLAGAL please refer to Health Canada's Notice of Compliance with conditions - drug products web site: <https://www.canada.ca/en/health-canada/services/drugs-health-products/drug-products/notice-compliance/conditions.html>

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What is a Notice of Compliance with Conditions (NOC/c)?

An NOC/c is a form of market approval granted to a product on the basis of promising evidence of clinical effectiveness following review of the submission by Health Canada.

Products authorized under Health Canada's NOC/c policy are intended for the treatment, prevention or diagnosis of a serious, life-threatening or severely debilitating illness. They have demonstrated promising benefit, are of high quality and possess an acceptable safety profile based on a benefit/risk assessment. In addition, they either respond to a serious unmet medical need in Canada or have demonstrated a significant improvement in the benefit/risk profile over existing therapies. Health Canada has provided access to this product on the condition that sponsors carry out additional clinical trials to verify the anticipated benefit within an agreed upon time frame.

RECENT MAJOR LABEL CHANGES

None

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Sections or subsections that are not applicable at the time of authorization are not listed.

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PART I: HEALTH PROFESSIONAL INFORMATION

1 INDICATIONS

REPLAGAL (agalsidase alfa) is indicated for:

- long-term enzyme replacement therapy in patients with a confirmed diagnosis of Fabry Disease (α -galactosidase A deficiency).

REPLAGAL treatment should be supervised by a physician experienced in the management of patients with Fabry disease or other inherited metabolic diseases.

1.1 Pediatrics

Pediatrics (<18 years of age)

The experience in children is limited. In children in clinical studies (7-18 years) who received REPLAGAL 0.2 mg/kg every other week for one to 4 years no unexpected safety issues were encountered. The safety and efficacy of REPLAGAL in children ages 0-6 years has not yet been established.

1.2 Geriatrics

Geriatrics (>65 years of age)

Studies specifically in patients over 65 years of age have not been performed and no dosage regimen can presently be recommended in these patients as safety and efficacy have not yet been established.

2 CONTRAINDICATIONS

REPLAGAL is contraindicated in patients with severe allergic reactions to the active substance or to any ingredient in the formulation or components of the container of REPLAGAL. For a complete listing, see 6 DOSAGE FORMS, STRENGTHS, COMPOSITION AND PACKAGING.

4 DOSAGE AND ADMINISTRATION

4.1 Dosing Considerations

- REPLAGAL is intended for long-term, chronic use
- REPLAGAL treatment should be supervised by a physician experienced in the management of patients with Fabry Disease or other inherited metabolic diseases
- Infusion of REPLAGAL at home may be considered for patients who are tolerating their infusions well.

4.2 Recommended Dose and Dosage Adjustment

REPLAGAL is administered at a dose of 0.2 mg/kg body weight every other week by intravenous infusion over 40 minutes.

4.4 Administration

1. Calculate the dose and number of REPLAGAL vials needed.
2. Dilute the total volume of REPLAGAL concentrate required in 100 mL of 9 mg/mL (0.9%) sodium chloride solution for infusion. Care must be taken to ensure the sterility of the prepared solutions since REPLAGAL does not contain any preservative or bacteriostatic agent; aseptic technique must be observed. Once diluted, the solution should be mixed gently but not shaken.
3. The solution should be inspected visually for particulate matter and discoloration prior to administration.
4. Administer the infusion solution over a period of 40 minutes using an intravenous line with an integral filter. Since no preservative is present, it is recommended that administration is started as soon as possible. After dilution, the product should be administered immediately.
5. Do not infuse REPLAGAL concomitantly in the same intravenous line with other agents.
6. For single use only. Any unused product or waste material should be disposed of in accordance with local requirements.

5 OVERDOSAGE

No case of overdose has been reported.

For management of a suspected drug overdose, contact your regional poison control centre.

6 DOSAGE FORMS, STRENGTHS, COMPOSITION AND PACKAGING

To help ensure the traceability of biologic products, including biosimilars, health professionals should recognise the importance of recording both the brand name and the non-proprietary (active ingredient) name as well as other product-specific identifiers such as the Drug Identification Number (DIN) and the batch/lot number of the product supplied.

Table 1 – Dosage Forms, Strengths, Composition and Packaging

Route of Administration	Dosage Form / Strength / Composition	Non-medicinal Ingredients
Intravenous (IV)	Concentrate for solution for intravenous infusion 1 mg/mL	Polysorbate 20 Sodium chloride Sodium hydroxide Sodium phosphate monobasic monohydrate Water for injection

Each vial of 3.5 mL concentrate for solution for infusion contains 3.5 mg of agalsidase alfa.

The concentrate must be diluted further prior to administration. (see 4.4 Administration).

3.5 mL of concentrate for solution for infusion in a 5 mL vial (Type 1 glass) with a fluoro-resin coated butyl rubber stopper, a one-piece aluminum seal and flip-off cap.

Pack size of 1 vial per carton.

7 WARNINGS AND PRECAUTIONS

Driving and Operating Machinery

REPLAGAL has no or negligible influence on the ability to drive and use machines.

Hepatic/Biliary/Pancreatic

No studies have been performed in patients with hepatic impairment.

Immune

Hypersensitivity reactions

Hypersensitivity reactions have been reported. If severe hypersensitivity or anaphylactic reactions occur, the administration of REPLAGAL should be discontinued immediately and appropriate treatment initiated. The current medical standards for emergency treatment are to be observed. (see 8 ADVERSE REACTIONS)

Idiosyncratic infusion-related reactions

In adult and pediatric patients treated with REPLAGAL in clinical studies idiosyncratic infusion-related reactions were very commonly reported. The most common symptoms have been rigors, headache, nausea, pyrexia, flushing and fatigue. Serious infusion reactions have been reported uncommonly; symptoms reported include pyrexia, rigors, tachycardia, urticaria, nausea/vomiting, angioneurotic edema with throat tightness, stridor and swollen tongue. Other infusion-related symptoms may include dizziness and hyperhidrosis. Infusion reactions may be associated with hemodynamic stress triggering cardiac events in patients with pre-existing cardiac manifestations of Fabry disease. The onset of infusion-related reactions has generally occurred within the first 2-4 months after initiation of treatment with REPLAGAL although later onset (after 1 year) has been reported as well. These effects have decreased with time. If mild or moderate acute infusion reactions occur, medical attention must be sought immediately and appropriate actions instituted. The infusion can be temporarily interrupted (5 to 10 minutes) until symptoms subside and the infusion may then be restarted. Mild and transient effects may not require medical treatment or discontinuation of the infusion. In addition, oral or intravenous pre-treatment with antihistamines and/or corticosteroids, from 1 to 24 hours prior to infusion may prevent subsequent reactions in those cases where symptomatic treatment was required. (see 8 ADVERSE REACTIONS)

Antibodies to the protein

As with all protein pharmaceutical products, patients may develop antibodies to the protein. A low titre anti-drug antibody response has been observed in approximately 9.4% of male patients treated with REPLAGAL after 12 months of treatment. (see 8 ADVERSE REACTIONS, Immunogenicity)

Renal

No dose adjustment is necessary in patients with renal impairment. The presence of extensive renal damage (eGFR < 60 mL/min) may limit the renal response to enzyme replacement therapy, possibly due to underlying irreversible pathological changes. In such cases, the loss of renal function remains within the expected range of the natural progression of the disease. Limited data are available in patients on dialysis or post-kidney transplantation, no dose adjustment is required.

Reproductive Health: Female and Male Potential Fertility

See 7.1.1 Special Populations: Pregnant Women

7.1 Special Populations

7.1.1 Pregnant Women

There is very limited data on pregnancies exposed to REPLAGAL. Animal studies do not indicate direct or indirect harmful effects with respect to pregnancy or embryonal/fetal development when exposed during organogenesis. (see 16 NON-CLINICAL TOXICOLOGY, Reproduction and Teratology Studies)

7.1.2 Breast-feeding

It is not known whether REPLAGAL is excreted in human milk. Caution should be exercised when prescribing REPLAGAL to nursing mothers.

7.1.3 Pediatrics

Pediatrics (<18 years of age): The experience in children is limited. In clinical studies of children (7-18 years of age) who received REPLAGAL 0.2 mg/kg every other week for one to 4 years, no unexpected safety issues were encountered.

7.1.4 Geriatrics

Geriatrics (>65 years of age): Studies specifically in patients over the age of 65 years old have not been performed and no dosage regimen can presently be recommended in these patients as safety and efficacy have not yet been established.

8 ADVERSE REACTIONS

8.1 Adverse Reaction Overview

The most common adverse reactions (occurring in at least 10% of patients) reported in patients treated with REPLAGAL in clinical studies were headache, nasopharyngitis, nausea, diarrhea, vomiting, cough, pain in limb, pyrexia, arthralgia, dizziness, back pain, fatigue, paraesthesia, pharyngitis, rigors, chest pain, neuropathic pain, abdominal pain, pain, peripheral edema, asthenia, myalgia, dyspnea, fatigue aggravated, rash, hypoesthesia, palpitations, tinnitus, flushing, peripheral swelling, tremor, and tinnitus aggravated.

The most serious adverse reactions in patients include abdominal discomfort, abdominal pain, anaphylactic reaction, arthralgia, asthenia, atrial fibrillation, chest pain, chest tightness, cough, diarrhea, dyspnea, erythema, heart failure, hypersensitivity, hypertension, hypoesthesia, malaise, myocardial ischemia, nasopharyngitis, nausea, neuropathic pain, palpitations, pyrexia, tachyarrhythmia, tachycardia, throat tightness, tremor, ventricular extrasystoles, and vomiting.

8.2 Clinical Trial Adverse Reactions

Clinical trials are conducted under very specific conditions. The adverse reaction rates observed in the clinical trials; therefore, may not reflect the rates observed in practice and should not be compared to the rates in the clinical trials of another drug. Adverse reaction information from clinical trials may be useful in identifying and approximating rates of adverse drug reactions in real-world use.

The most common adverse reactions reported in the clinical studies were infusion-related reactions, which occurred very commonly (13.7% of patients) in adults patients treated with REPLAGAL. (see 7 WARNINGS AND PRECAUTIONS)

The adverse reactions presented in Table 2 have been reported in 177 patients treated with REPLAGAL at a dose of 0.2 mg/kg every other week in 11 clinical trials (1 Phase I/II trial, 7 Phase II trials and 3 Phase III trials), ranging in treatment durations of at least 9-51 weeks to 3 years. These clinical trials included 21 patients with history of end-stage renal disease, 24 pediatric patients (7 to 17 years of age) and 17 female patients. Information is presented by system organ class and frequency (very common $\geq 1/10$; common $\geq 1/100$, $< 1/10$).

Table 2 – Adverse Reactions Reported ($\geq 1\%$) for REPLAGAL in Clinical Studies

System Organ Class & Adverse Reaction	Frequency Category	Number and Frequency by Subjects N=177 (%)
Cardiac disorders		
Palpitations	Very common	26 (15)
Tachycardia	Common	6 (3)
Atrial fibrillation	Common	4 (2)
Ear and labyrinth disorders		
Tinnitus	Very common	24 (14)
Tinnitus aggravated	Very common	19 (11)
Eye disorders		
Lacrimation increased	Common	3 (2)
Gastrointestinal disorders		
Nausea	Very common	75 (42)
Diarrhea	Very common	74 (42)
Vomiting	Very common	71 (40)
Abdominal pain	Very common	46 (26)
Abdominal discomfort	Common	4 (2)
General disorders and administration site conditions		
Pyrexia	Very common	67 (38)
Fatigue	Very common	55 (31)
Rigors	Very common	50 (28)
Chest pain	Very common	47 (27)
Pain	Very common	44 (25)
Asthenia	Very common	37 (21)
Fatigue aggravated	Very common	29 (16)
Influenza like illness	Common	17 (10)
Malaise	Common	15 (8)
Chest tightness	Common	13 (7)

System Organ Class & Adverse Reaction	Frequency Category	Number and Frequency by Subjects N=177 (%)
Feeling hot	Common	9 (5)
Feeling cold	Common	7 (4)
Discomfort	Common	3 (2)
Injection site rash	Common	2 (1)
Immune system disorders		
Hypersensitivity	Common	9 (5)
Investigations		
Corneal reflex decreased	Common	2 (1)
Metabolism and nutrition disorders		
Peripheral edema	Very common	43 (24)
Musculoskeletal and connective tissue disorders		
Pain in limb	Very common	70 (40)
Arthralgia	Very common	59 (33)
Back pain	Very common	56 (32)
Myalgia	Very common	35 (20)
Peripheral swelling	Very common	20 (11)
Joint swelling	Common	15 (8)
Musculoskeletal discomfort	Common	5 (3)
Nervous system disorders		
Headache	Very common	111 (63)
Dizziness	Very common	59 (33)
Paraesthesia	Very common	53 (30)
Neuropathic pain	Very common	47 (27)
Hypoesthesia	Very common	27 (15)
Tremor	Very common	20 (11)
Dysgeusia	Common	5 (3)
Hypersomnia	Common	4 (2)
Respiratory, thoracic and mediastinal disorders		
Nasopharyngitis	Very common	88 (50)
Cough	Very common	70 (40)
Pharyngitis	Very common	52 (29)
Dyspnea	Very common	31 (18)
Rhinorrhea	Common	11 (6)
Throat tightness	Common	10 (6)
Hoarseness	Common	6 (3)
Throat secretion increased	Common	2 (1)
Skin and subcutaneous tissue disorders		
Rash	Very common	29 (16)
Acne	Common	13 (7)
Erythema	Common	11 (6)
Pruritus	Common	10 (6)
Livedo reticularis	Common	2 (1)
Urticaria	Common	2 (1)
Vascular disorders		
Flushing	Very common	21 (12)

System Organ Class & Adverse Reaction	Frequency Category	Number and Frequency by Subjects N=177 (%)
Hypertension	Common	14 (8)
Hypotension	Common	9 (5)

Adverse drug reactions reported in patients with a history of end stage renal disease were similar to those reported in the general study population.

Immunogenicity

As with all protein pharmaceutical products, patients may develop antibodies to the protein. A low titer anti-drug antibody response has been observed in approximately 9.4% of male patients treated with REPLAGAL after 12 months of treatment. These anti-drug antibodies appeared to develop following approximately 6-12 months of treatment. After 18 to 24 months of therapy, 6.3% of REPLAGAL-treated patients were still antibody positive. In other studies, after 12 to 54 months of therapy, 17% of REPLAGAL-treated patients were still antibody-positive. Borderline IgE antibody positivity not associated with anaphylaxis has been reported in clinical trials in a very limited number of patients. (see 7 WARNINGS AND PRECAUTIONS)

8.2.1 Clinical Trial Adverse Reactions - Pediatrics

Adverse reactions reported in pediatric patients in clinical studies were generally similar to those reported in adults. However, infusion-related reactions (pyrexia, dyspnea, chest pain) and pain exacerbation occurred more frequently in pediatric patients than in adults. (see 7 WARNINGS AND PRECAUTIONS)

8.3 Less Common Clinical Trial Adverse Reactions

Cardiac disorders: Tachyarrhythmia

Investigations: Oxygen saturation decreased

Musculoskeletal and connective tissue disorders: Sensation of heaviness

Nervous system disorders: Parosmia

Skin and subcutaneous tissue disorders: Angioneurotic edema

8.5 Post-Market Adverse Reactions

Infusion-related reactions may include cardiac events such as cardiac arrhythmias (atrial fibrillation, ventricular extrasystoles, tachyarrhythmia), myocardial ischemia and heart failure in patients with Fabry disease involving heart structures. The most common infusion-related reactions were mild and include rigors, pyrexia, flushing, headache, nausea, dyspnea, tremor and pruritus. Infusion-related symptoms may also include dizziness, hyperhidrosis, hypotension, cough, vomiting, and fatigue. Hypersensitivity, including anaphylaxis, has been reported. (see 7 WARNINGS AND PRECAUTIONS)

Other Clinical Trial completed Post-Approval – Study HGT-REP-081

Table 3 summarizes adverse reactions observed in a multicenter open-label treatment protocol that included 167 patients with Fabry disease who received 0.2 mg/kg every other week for up to 310 weeks.

Table 3 – Adverse Reactions Reported ($\geq 1\%$) for REPLAGAL in Study HGT-REP-081 completed Post-Approval*

System Organ Class & Adverse Reaction	Frequency Category	Number and Frequency by Subjects N=167 (%)
General disorders and administration site conditions		
Pain	Common	16 (10)
Asthenia	Common	14 (8)
Skin and subcutaneous tissue disorders		
Hyperhidrosis	Very common	19 (11)
Vascular disorders		
Hypotension	Very common	18 (11)
Hypertension	Very common	17 (10)
Flushing	Common	9 (5)

Less common adverse reactions observed in Study HGT-REP-081 include: *

General disorders and administration site conditions: discomfort, feeling hot

Immune system disorders: anaphylactic reaction

Nervous system disorders: hypersomnia

*Adverse reactions already listed in Table 2 (Adverse Reactions Reported ($\geq 1\%$) for REPLAGAL in Clinical Studies) and 8.3 Less Common Clinical Trial Adverse Reactions are not repeated unless there are changes in frequency.

9 DRUG INTERACTIONS

9.4 Drug-Drug Interactions

REPLAGAL should not be co-administered with chloroquine, amiodarone, benoquin or gentamicin since these substances have the potential to inhibit intracellular α -galactosidase activity.

As α -galactosidase A is itself an enzyme, it would be unlikely candidate for cytochrome P450 mediated drug-drug interactions. In clinical studies, neuropathic pain medicinal products (e.g., gabapentin) were administered concurrently to most patients without any evidence of interaction.

9.5 Drug-Food Interactions

Interactions with food have not been established.

9.6 Drug-Herb Interactions

Interactions with herbal products have not been established.

9.7 Drug-Laboratory Test Interactions

Interactions with laboratory tests have not been established.

10 CLINICAL PHARMACOLOGY

10.1 Mechanism of Action

Fabry Disease is a glycosphingolipid storage disorder that is caused by deficient activity of the lysosomal enzyme α -galactosidase A, resulting in accumulation of globotriaosylceramide (also referred to as Gb₃ or CTH), the glycosphingolipid substrate for this enzyme. Agalsidase alfa catalyzes the hydrolysis of Gb₃, cleaving a terminal galactose residue from the molecule. Treatment with the enzyme has been shown to reduce accumulation of Gb₃ in many cell types including endothelial and parenchymal cells. Agalsidase alfa has been produced in a human cell line to provide for a human glycosylation profile that influences biodistribution to allow preferential uptake by target cells.

10.2 Pharmacodynamics

Agalsidase alfa is a human α -galactosidase A produced in a human cell line by genetic engineering technology. Agalsidase alfa is a homodimer which consists of 2 approximately 50,000 Dalton subunits, with each subunit consisting of 398 amino acids. The product is post-translationally modified by the removal of a signal sequence of 31 residues and by the addition of carbohydrate chains to 3N-linked glycosylation sites.

Agalsidase alfa is targeted to its lysosomal site of action by mannose-6-phosphate (M6P) residues on the agalsidase alfa molecule. The M6P moiety binds to a specific M6P receptor on the cell surface and is thus directed to the lysosomes. Many cells in the body contain M6P receptors, and agalsidase alfa has been shown to be taken up by the liver, kidney, heart, and blood vessels.

Agalsidase alfa is a highly purified preparation. Biological activity of agalsidase alfa is measured using the water soluble substrate 4-methylumbelliferyl- α -D-galactopyranoside (4-MUF-gal), and biological potency is measured based on its ability to be taken up by normal human cells.

Non-clinical Pharmacodynamics

Agalsidase alfa was evaluated for pharmacological effect in a “knockout” mouse model of α -galactosidase A deficiency.

Immunostaining of tissues from mice treated with a single dose of agalsidase alfa at 1.0 mg/kg provided direct evidence that intravenously administered agalsidase alfa was taken up by liver, heart, and kidney cells. A single dose of 0.2 mg/kg was sufficient to catabolize stored Gb₃ in the liver, heart, and kidney. Multiple injections of 0.1 and 1.0 mg/kg restored liver to almost normal levels of Gb₃ and significantly improved the reduction of Gb₃ in heart and kidney. The results of this study have shown that intravenously dosed agalsidase alfa is effectively targeted to key tissues that show storage induced pathology in Fabry Disease, indicating that it reaches the lysosomes in an active form.

10.3 Pharmacokinetics

REPLAGAL 0.2 mg per kg body weight were administered to 17 adult male patients with Fabry Disease as 40-minute intravenous infusions. Following the infusion, agalsidase alfa had a biphasic distribution and elimination profile from the circulation. The median clearance of agalsidase alfa normalized for body weight was 3.4 mL/min/kg (range: 0.6, 85.5 mL/min/kg). The median volume of distribution was 203 mL/kg (range: 89, 6778 mL/kg), and the median elimination half-life was 54.7 min (range: 28.5, 654.2 min).

Based on the analysis of pre- and post-dose liver biopsies in males with Fabry Disease treated with agalsidase alfa manufactured using a different method, the tissue half-life has been estimated to be in excess of 24 hours and hepatic uptake of the enzyme estimated to be 10% of administered dose at the therapeutic dose level of 0.2 mg/kg.

In three studies with pharmacokinetic evaluations in Fabry patients receiving REPLAGAL 0.2 mg/kg body weight every other week, 4 of 17 adult male Fabry patients, 4 of 14 pediatric Fabry patients, and 2 of 10 adolescent / young adult Fabry patients tested positive for anti-agalsidase alfa antibodies (6 patients were IgM+; 4 patients were IgG+). Of the 6 IgM+ patients, 1 tested positive for neutralizing antibodies. Of the 4 IgG+ patients, 3 tested positive for neutralizing antibodies. Following six months of REPLAGAL treatment, some male patients showed altered pharmacokinetics including an apparent increase in clearance. These changes were associated with the development of low titer antibodies to agalsidase alfa.

Agalsidase alfa is a protein. It is not expected to bind to proteins. It is expected that its metabolic degradation will follow the pathways of other proteins, i.e. peptide hydrolysis. Agalsidase alfa is unlikely to be a candidate for drug-drug interactions.

Special Populations and Conditions

Pediatrics: In 14 pediatric Fabry patients (7 to <18 years old), median clearance of REPLAGAL was 4.7 mL/min/kg (range: 2.1, 8.2 mL/min/kg). The mean (SD) volume of distribution was 128 mL/kg (51 mL/kg) and the mean (SD) elimination half-life was 32 min (9 min). In a separate long-term pediatric study of 10 adolescents / young adults with Fabry disease (15 to 23 years old), median clearance of REPLAGAL was 3.1 mL/min/kg (range: 1.2, 20 mL/min/kg).

Sex: Pharmacokinetic parameters were not significantly different between men and women.

Ethnic Origin: Formal pharmacokinetic studies for race have not been conducted.

Hepatic Insufficiency: As metabolism is expected to occur by peptide hydrolysis, impaired liver function is not expected to affect the pharmacokinetics of agalsidase alfa in a clinically significant manner.

Renal Insufficiency: Renal elimination of agalsidase alfa is considered to be a minor clearance pathway since pharmacokinetic parameters are not altered by impaired renal function. (see 7 WARNINGS AND PRECAUTIONS, Renal).

11 STORAGE, STABILITY AND DISPOSAL

Store in a refrigerator (2 - 8°C).

REPLAGAL diluted into normal saline should be used as soon as practicable after preparation, as the product does not contain any bacteriostatic preservatives. However, when prepared under aseptic conditions, the diluted product may be stored for 24 hours at 2 to 8°C.

For single use only. Any unused product or waste material should be disposed of in accordance with local requirements.

PART II: SCIENTIFIC INFORMATION

13 PHARMACEUTICAL INFORMATION

Drug Substance

Proper name (USAN/INN): agalsidase alfa

Chemical name: agalsidase alfa

Other name: Gene-activated α -galactosidase A

Molecular formula and molecular mass:

The mature enzyme is a glycoprotein which consists of a homodimer of 2 approximately 50,000 dalton molecular weight subunits, each consisting of 398 amino acids.

Structural formula:

Agalsidase alfa is the active pharmaceutical ingredient in the drug product REPLAGAL, and is the human protein α -galactosidase A produced by a well-characterized human cell line by genetic engineering technology. Agalsidase alfa is post-translationally modified by the removal of a signal sequence of 31 residues and by the addition of carbohydrate chains to 3 N-linked glycosylation sites (circled in illustration).

Physicochemical properties:

Agalsidase alfa drug substance is a clear colorless solution. As formulated in sodium phosphate and sodium chloride, agalsidase alfa has a pH of 6.0 ± 0.5 .

Human α -Galactosidase A Sequence

1 Leu Asp Asn Gly Leu Ala Arg Thr Pro Thr Met Gly Trp Leu His Trp Glu
18 Arg Phe Met Cys Asn Leu Asp Cys Gln Glu Glu Pro Asp Ser Cys Ile Ser
35 Glu Lys Leu Phe Met Glu Met Ala Glu Leu Met Val Ser Glu Gly Trp Lys
52 Asp Ala Gly Tyr Glu Tyr Leu Cys Ile Asp Asp Cys Trp Met Ala Pro Gln
69 Arg Asp Ser Glu Gly Arg Leu Gln Ala Asp Pro Gln Arg Phe Pro His Gly
86 Ile Arg Gln Leu Ala Asn Tyr Val His Ser Lys Gly Leu Lys Leu Gly Ile
103 Tyr Ala Asp Val Gly (Asn) Lys Thr Cys Ala Gly Phe Pro Gly Ser Phe Gly
120 Tyr Tyr Asp Ile Asp Ala Gln Thr Phe Ala Asp Trp Gly Val Asp Leu Leu
137 Lys Phe Asp Gly Cys Tyr Cys Asp Ser Leu Glu Asn Leu Ala Asp Gly Tyr
154 Lys His Met Ser Leu Ala Leu (Asn) Arg Thr Gly Arg Ser Ile Val Tyr Ser
171 Cys Glu Trp Pro Leu Tyr Met Trp Pro Phe Gln Lys Pro (Asn) Tyr Thr Glu
188 Ile Arg Gln Tyr Cys Asn His Trp Arg Asn Phe Ala Asp Ile Asp Asp Ser
205 Trp Lys Ser Ile Lys Ser Ile Leu Asp Trp Thr Ser Phe Asn Gln Glu Arg
222 Ile Val Asp Val Ala Gly Pro Gly Gly Trp Asn Asp Pro Asp Met Leu Val
239 Ile Gly Asn Phe Gly Leu Ser Trp Asn Gln Gln Val Thr Gln Met Ala Leu
256 Trp Ala Ile Met Ala Ala Pro Leu Phe Met Ser Asn Asp Leu Arg His Ile
273 Ser Pro Gln Ala Lys Ala Leu Leu Gln Asp Lys Asp Val Ile Ala Ile Asn
290 Gln Asp Pro Leu Gly Lys Gln Gly Tyr Gln Leu Arg Gln Gly Asp Asn Phe
307 Glu Val Trp Glu Arg Pro Leu Ser Gly Leu Ala Trp Ala Val Ala Met Ile
324 Asn Arg Gln Glu Ile Gly Gly Pro Arg Ser Tyr Thr Ile Ala Val Ala Ser
341 Leu Gly Lys Gly Val Ala Cys Asn Pro Ala Cys Phe Ile Thr Gln Leu Leu
358 Pro Val Lys Arg Lys Leu Gly Phe Tyr Glu Trp Thr Ser Arg Leu Arg Ser
375 His Ile Asn Pro Thr Gly Thr Val Leu Leu Gln Leu Glu Asn Thr Met Gln
392 Met Ser Leu Lys Asp Leu Leu

14 CLINICAL TRIALS

14.1 Trial Design and Study Demographics

Efficacy Studies

Table 4 - Summary of patient demographics and study design for clinical trials in Adults

Study #	Trial design	Dosage, route of administration and duration	Study subjects receiving Replagal (n=number)	Mean age (Range)	Sex
TKT 028	Multicenter, open-label randomized study to evaluate safety and efficacy of 3 REPLAGAL dose regimens in adults with Fabry disease	0.2mg/kg EOW, 0.2mg/kg weekly, and 0.4mg/kg weekly by i.v. infusion 12 months	META-ANALYSIS OF ADULT PATIENTS FOR CARDIAC PARAMETERS n = 153 Mean age: 47.3 yrs (19-84 yrs) Male: 58% Female: 42%		
HGT-REP-060	Open-label, multicenter, extension of study TKT 028 to evaluate safety and efficacy of REPLAGAL in adults with Fabry disease	0.2mg/kg EOW by i.v. infusion 12 months			
HGT-REP-059	Open-label, multicenter, single-arm study to evaluate safety of REPLAGAL in adults with Fabry disease	0.2mg/kg EOW by i.v. infusion 24 months			
CFDI-001	Open-label, multicenter observational study to evaluate the effects of enzyme replacement therapy in Canadian patients with Fabry disease (<i>interim report including patients receiving REPLAGAL</i>)	0.2mg/kg EOW or 0.2mg/kg weekly by i.v. infusion 10 years			
			META-ANALYSIS OF ADULT PATIENTS FOR RENAL PARAMETERS n = 183 Mean age: 48.6 yrs (20-84 yrs) Male: 51% Female: 49%		

EOW = every other week

Table 5 - Summary of patient demographics and study design for clinical trials in Pediatric Patients

Study #	Trial design	Dosage, route of administration and duration	Study subjects receiving REPLAGAL (n=number)	Mean age (Range)	Sex
HGT-REP-084	Open-label, multicenter study to evaluate safety of REPLAGAL in pediatric patients with Fabry disease who are enzyme replacement treatment-naïve.	0.2mg/kg EOW by i.v. infusion 12 months	n=14	12.16 yrs (6.7-15.9 yrs)	Male: 35.7% Female: 64.3%

EOW = every other week

14.2 Study Results

A summary of the results of the meta-analysis of cardiac and renal parameters from REPLAGAL (agalsidase alfa) studies in adult patients with Fabry Disease who were treatment-naïve at baseline are presented in Table 6.

Table 6 – Results of Meta-analysis of Studies in Adult patients with Fabry Disease treated with REPLAGAL 0.2 mg/kg EOW who were Treatment-naïve at Baseline

Primary analysis	Mean baseline value (SD)	Adjusted Annualized Rate of Change using a Random Coefficient Model (AARC by RIS) (95% CI)
Left ventricular mass index (LVMI) (g/m ^{2.7}) (n=30)	56.1 (23.39)	0.32 (-2.07, 2.71)
Estimated glomerular filtration rate (eGFR) (mL/min/1.73m ²) (n=38)	79.0 (27.34)	-0.85 (-3.85, 2.15)

CI = Confidence interval; SD = Standard deviation; EOW = every other week

Cardiac Effects

The annual rate of change (95% CI) of LVMI in adult treatment-naïve patients (n=30), treated with REPLAGAL 0.2 mg/kg administered EOW over a mean of 1.95 (0.9 - 3.1) years, was 0.32 (-2.07, 2.71) g/m^{2.7} demonstrating the stabilizing effect of REPLAGAL on this parameter (see Table 6). This was further corroborated by the average annual rates of change for interventricular septum end-diastole thickness (IVSTd) and posterior wall thickness (PWTd).

The annual rates of change (95% CI) for cardiac parameters in adult patients treated with REPLAGAL 0.2 mg/kg administered EOW regardless of treatment at baseline (n=153) were:

- 0.31 (-0.77, 1.38) g/m^{2.7} for LVMI from a mean (SD) at baseline of 62.5 (26.6) g/m^{2.7},
- 0.009 (-0.014, 0.031) cm for IVSTd from a mean (SD) at baseline of 1.41 (0.47) cm, and
- -0.014 (-0.032, 0.005) cm for PWTd from a mean (SD) at baseline of 1.31 (0.38) cm.

In a subset of patients with left-ventricular hypertrophy at baseline (n=98) the average annual rates of change (95% CI) for cardiac parameters in patients on treatment with REPLAGAL were close to zero, further supporting a positive treatment effect:

- -0.12 (-1.67, 1.43) g/m^{2.7} for LVMI from a mean (SD) at baseline of 76.3 (23.3) g/m^{2.7},
- -0.002 (-0.026, 0.021) cm for IVSTd from a mean (SD) at baseline of 1.63 (0.44) cm, and
- -0.033 (-0.059, -0.007) cm for PWTd from a mean (SD) at baseline of 1.48 (0.35) cm.

Effects on Renal Function

The annual rate of change (95% CI) of eGFR in adult treatment-naïve patients (n=38), treated with REPLAGAL 0.2 mg/kg administered EOW over a mean of 1.97 (0.9 – 3.1) years, was -0.85 (-3.85, 2.15) mL/min/1.73m², thus providing a strong indication of a reduction of decline in renal function in patients with Fabry disease (see Table 6).

The annual rate of change (95% CI) of eGFR in adult patients treated with REPLAGAL 0.2 mg/kg administered EOW regardless of treatment at baseline (n=183), with a mean (SD) eGFR at baseline of 81.2 (26.32) mL/min/1.73m², was -3.26 (-4.36, -2.17) mL/min/1.73m².

In a subset of these patients with baseline eGFR below normal values, the annual rates of changes (95% CI) for eGFR in patients on treatment with REPLAGAL further demonstrated REPLAGAL's effect on the reduction of decline in renal function:

- -2.25 (-3.54, -0.96) mL/min/1.73m² for eGFR in patients with CKD Stage 2 at baseline (n=78) with a mean baseline (SD) eGFR of 75.6 (8.01) mL/min/1.73m², and
- -2.95 (-5.19, -0.71) mL/min/1.73m² for eGFR in patients with CKD Stage 3 at baseline (n=24) with mean baseline (SD) eGFR of 45.9 (9.6) mL/min/1.73m².

Results in Pediatric Patients

In a 55-week open-label multicenter study to evaluate the safety of REPLAGAL in pediatric patients with Fabry disease who are enzyme replacement treatment-naïve, an additional primary objective was to assess the changes in heart rate variability (HRV) (as an assessment of cardiac autonomic function) with LVMI and eGFR among secondary endpoints. The analyses of HRV indicated that time domain HRV indices remained stable or trended towards improvement. The baseline LVMI values for males and females were within the normal range (<51 g/m^{2.7} for males and <48 g/m^{2.7} for females) and overall, the mean baseline LVMI was 35.37 g/m^{2.7}. At Week 55, the mean LVMI changed by 0.16 g/m^{2.7}. Taken together, the study results indicated a potential stabilization or trend toward improvement in the cardiac function when treatment was started as soon as children with Fabry disease had low or abnormal HRV and before they developed left-ventricular hypertrophy. Overall and by sex, assessments of renal function remained stable over the course of REPLAGAL treatment. The mean baseline eGFR was 117.50 mL/min/1.73 m² and none of the patients had eGFR ≤60 mL/min/1.73 m² at baseline. The mean change in eGFR from baseline at Week 55 was 0.15 mL/min/1.73 m².

Effects on Plasma Gb₃ Levels

The effect of REPLAGAL on plasma Gb₃ was analyzed in treatment-naïve male patients receiving 0.2 mg/kg administered EOW in an open-label study. Plasma Gb₃ levels generally

decreased over time. At baseline, the mean (SD) plasma Gb₃ was 19.0 (9.84) nmol/mL. After 12 months (n=9), 18 months (n=8), and 24 months (n=3) of treatment, the mean change (SD) in plasma Gb₃ from baseline was -8.2 (5.01) nmol/mL, -9.8 (10.04) nmol/mL, and -10.5 (1.95) nmol/mL, respectively.

Post-market experience

Total worldwide exposure to REPLAGAL, as of July 31, 2015, was estimated to be 14,683 patient-years.

16 NON-CLINICAL TOXICOLOGY

Acute Toxicity Studies

The acute toxicity of agalsidase alfa was evaluated in rats. Doses of up to 10 mg/kg body weight, representing 50 times the recommended clinical dose, have been tested without any adverse toxicity.

Subacute and Subchronic Toxicity Studies

Multiple dose toxicity of agalsidase alfa was evaluated using rats, rabbits and monkeys. Doses of up to five times the recommended clinical dose and at twice the dosing frequency were tested for 13 and 26 weeks in rats, and 13 weeks in monkeys. No adverse toxicity was observed. No toxicity was observed in a 14-day, daily-dosing, range finding study in rabbits.

Reproduction and Teratology Studies

A reproductive study in male rats used a maximum dose of 1.0 mg/kg and a dosing frequency of 3 times per week. There were no adverse effects of intravenous dosing of agalsidase alfa on male reproductive organs or on any assessment of male reproduction.

A combined fertility/teratology study in female rats used a maximum dose of 1.0 mg/kg body weight with daily dosing from pre-mating, through mating and day 17 of gestation. There were no adverse effects of intravenous dosing of agalsidase alfa on maternal reproductive performance as indicated by mating index, fertility index, pre- and post-implantation losses, or by fetal sex ratio. There were no treatment related changes in the frequency of major malformations, minor external or visceral abnormalities, or skeletal abnormalities in the examined fetuses. A teratology study in rabbits was also conducted using intravenous doses up to 1.0 mg/kg body weight per day from days 7 through 19 of gestation. There were no adverse maternal or fetal development effects observed.

It is not known whether agalsidase alfa crosses the placenta.

Both males and females were used for the majority of the studies and no sex related differences were observed in toxicity or in pharmacokinetics.

Mutagenicity and Carcinogenicity Studies

Mutagenicity and carcinogenicity studies were not conducted, however genotoxic and carcinogenic potential are not expected.

PATIENT MEDICATION INFORMATION

READ THIS FOR SAFE AND EFFECTIVE USE OF YOUR MEDICINE

PrREPLAGAL®

agalsidase alfa for injection

Read this carefully before you start taking **REPLAGAL** and each time you get a refill. This leaflet is a summary and will not tell you everything about this drug. Talk to your healthcare professional about your medical condition and treatment and ask if there is any new information about **REPLAGAL**.

What is REPLAGAL used for?

REPLAGAL is used to treat patients with a confirmed diagnosis of Fabry Disease.

For the following indication REPLAGAL has been approved with conditions (NOC/c). This means it has passed Health Canada's review and can be bought and sold in Canada, but the manufacturer has agreed to complete more studies to make sure the drug works the way it should. For more information, talk to your healthcare professional.

REPLAGAL (agalsidase alfa) is indicated for:

- long-term enzyme replacement therapy in patients with a confirmed diagnosis of Fabry Disease.

What is a Notice of Compliance with Conditions (NOC/c)?

A Notice of Compliance with Conditions (NOC/c) is a type of approval to sell a drug in Canada.

Health Canada only gives an NOC/c to a drug that treats, prevents, or helps identify a serious or life-threatening illness. The drug must show promising proof that it works well, is of high quality, and is reasonably safe. Also, the drug must either respond to a serious medical need in Canada, or be much safer than existing treatments.

Drug makers must agree in writing to clearly state on the label that the drug was given an NOC/c, to complete more testing to make sure the drug works the way it should, to actively monitor the drug's performance after it has been sold, and to report their findings to Health Canada.

How does REPLAGAL work?

REPLAGAL is a long-term enzyme replacement therapy when the level of enzyme in the body is absent or lower than normal as in Fabry Disease.

What are the ingredients in REPLAGAL?

Medicinal ingredients: agalsidase alfa

Non-medicinal ingredients: polysorbate 20, sodium chloride, sodium hydroxide, sodium phosphate monobasic monohydrate, and water for injection.

REPLAGAL comes in the following dosage forms:

1 mg/mL concentrate for solution for injection.

Do not use REPLAGAL if:

- you are allergic (hypersensitive) to agalsidase alfa, the medicinal ingredient, or to any of the other ingredients in REPLAGAL or its container

To help avoid side effects and ensure proper use, talk to your healthcare professional before you take REPLAGAL. Talk about any health conditions or problems you may have, including if:

- you experience any of the following during infusion with REPLAGAL:
 - High fever, chills, sweating, fast heart rate
 - Nausea or are vomiting
 - Headaches, feel light-headedness or fatigue
 - Hives
 - Swelling in your hands, feet, ankles, face, lips, mouth or throat which may cause difficulty in swallowing or breathing

Your doctor/nurse may stop the infusion temporarily (5 – 10 minutes) until the symptoms go away and then begin the infusion again.

Your doctor may also treat the symptoms with other medicines (antihistamines or corticosteroids). Most of the time you can still be given REPLAGAL even if these symptoms occur.

- you experience a severe allergic (anaphylactic-type) reaction. The administration of REPLAGAL will be immediately discontinued and an appropriate treatment will have to be initiated by your doctor.
- treatment with REPLAGAL makes your body produce antibodies.
- you have advanced renal disease.

Tell your healthcare professional about all the medicines you take, including any drugs, vitamins, minerals, natural supplements or alternative medicines.

The following may interact with REPLAGAL:

- Chloroquine
- Amiodarone
- Benoquin
- Gentamicin

How to take REPLAGAL:

REPLAGAL treatment should be supervised by a physician experienced in the management of patients with Fabry Disease or other inherited metabolic disease. Infusion of REPLAGAL at home may be considered for patients who are tolerating their infusions well.

REPLAGAL has to be diluted in 9 mg/mL (0.9%) sodium chloride solution before use. After dilution, REPLAGAL is given in a vein. This will usually be in your arm. The infusion will be given every 2 weeks. Each time you are treated, it will take 40 minutes for REPLAGAL to be given to you in a vein. Do not use REPLAGAL if you notice that there is discoloration or other foreign particles present.

Usual dose:

Adults:

The dose is an intravenous infusion (in a vein) of 0.2 mg for every kg you weigh over 40 minutes. This would be about 14 mg or four 5 mL vials (glass bottles) of REPLAGAL for an average size (70 kg) individual. The intravenous infusion will be given every 2 weeks.

Children and adolescents:

For children and adolescents 7-18 years old, a dose of 0.2 mg/kg every 2 weeks may be used.

Overdose:

There is no experience of overdose with REPLAGAL.

If you think you, or a person you are caring for, have taken too much REPLAGAL, contact a healthcare professional, hospital emergency department or regional poison control centre immediately, even if there are no symptoms.

What are possible side effects from using REPLAGAL?

These are not all the possible side effects you may have when taking REPLAGAL. If you experience any side effects not listed here, tell your healthcare professional.

Most common side effects with REPLAGAL include headache, pain in limb, dizziness, back pain, fatigue, tingling, sore throat, chills, pain, swelling of the hands or feet, muscle pain, worsened fatigue, rash, ringing in ears, flushing, and worsened ringing in the ears.

Serious side effects and what to do about them			
Symptom / effect	Talk to your healthcare professional		Stop running infusion and get immediate medical help
	Only if severe	In all cases	
VERY COMMON			
Abdominal pain	√		
Arthralgia: joint pain	√		
Asthenia: weakness	√		
Chest pain		√	√
Cough	√		
Diarrhea	√		
Dyspnea: trouble breathing		√	√

Serious side effects and what to do about them			
Symptom / effect	Talk to your healthcare professional		Stop running infusion and get immediate medical help
	Only if severe	In all cases	
Hypoesthesia: loss of sensation		√	
Nasopharyngitis: sore nose or throat	√		
Nausea	√		
Neuropathic pain: burning or shooting pain		√	
Palpitations: pounding or irregular heartbeat		√	√
Pyrexia: fever	√		
Tremor	√		
Vomiting	√		
COMMON			
Abdominal discomfort	√		
Atrial fibrillation: fast and irregular heartbeats		√	√
Chest or throat tightness		√	√
Erythema: reddening of the skin	√		
Hypersensitivity		√	
Hypertension		√	
Malaise: uneasiness	√		
Tachycardia: abnormally fast heart rate		√	√
UNCOMMON			
Anaphylactic reaction: severe allergic reaction		√	√
Tachyarrhythmia: fast heartbeats		√	√
NOT KNOWN			
Heart failure (shortness of breath, swelling)		√	
Myocardial ischemia: heart attack (chest pain, shortness of breath, pain in arm, neck, or jaw)		√	√
Ventricular extrasystoles: irregular extra heartbeats		√	√

If you have a troublesome symptom or side effect that is not listed here or becomes bad enough to interfere with your daily activities, tell your healthcare professional.

Reporting Side Effects

You can report any suspected side effects associated with the use of health products to Health Canada by:

- Visiting the Web page on Adverse Reaction Reporting (<https://www.canada.ca/en/health-canada/services/drugs-health-products/medeffect-canada.html>) for information on how to report online, by mail or by fax; or
- Calling toll-free at 1-866-234-2345.

NOTE: Contact your health professional if you need information about how to manage your side effects. The Canada Vigilance Program does not provide medical advice.

Storage:

Store REPLAGAL in a refrigerator at 2 to 8°C.

Keep out of reach and sight of children.

If you want more information about REPLAGAL:

- Talk to your healthcare professional
- Find the full product monograph that is prepared for healthcare professionals and includes this Patient Medication Information by visiting the Health Canada website (<https://www.canada.ca/en/health-canada/services/drugs-health-products/drug-products/drug-product-database.html>); the manufacturer's website (www.takeda.com/en-ca), or by calling 1-800-268-2772.

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