

# PRODUCT MONOGRAPH

INCLUDING PATIENT MEDICAL INFORMATION

Pr **CERDELGA™**  
Eliglustat capsules  
84 mg eliglustat (as eliglustat tartrate)

ATC Code: A16AX10

Various Alimentary Tract and Metabolism Product

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**CERDELGA**  
eliglustat capsules

**PART I: HEALTH PROFESSIONAL INFORMATION**

**SUMMARY PRODUCT INFORMATION**

<b>Route of Administration</b>	<b>Dosage Form / Strength</b>	<b>Clinically Relevant Nonmedicinal Ingredients</b>
Oral	Capsule 84 mg eliglustat, as eliglustat tartrate	Each capsule contains 106 mg lactose (as monohydrate). For a complete listing of non-medicinal ingredients, see <b>DOSAGE FORMS, COMPOSITION AND PACKAGING</b> section.

**INDICATIONS AND CLINICAL USE**

CERDELGA (eliglustat) is indicated for the long-term treatment of adult patients with Gaucher disease type 1 (GD1) who are CYP2D6 poor metabolizers (PMs), intermediate metabolizers (IMs) or extensive metabolizers (EMs), as determined by CYP2D6 genotype testing.

**Limitations of Use**

CERDELGA should not be used in patients genotyped as:

- CYP2D6 ultra-rapid metabolizers (URMs) as these patients may not achieve adequate concentrations of CERDELGA to achieve a therapeutic effect
- CYP2D6 indeterminate metabolizers as a specific dosage cannot be recommended for these patients

**Geriatrics (≥ 65 years of age):**

A limited number of patients aged 65 years and over were enrolled in clinical trials. As greater rates of hepatic, renal, and cardiac function impairment are observed in elderly patients, this patient population may be more sensitive to the effects of CERDELGA (see **WARNINGS AND PRECAUTIONS** and **DOSAGE AND ADMINISTRATION**).

**Pediatrics (< 18 years of age):**

Safety and effectiveness in pediatric patients have not been established.

## CONTRAINDICATIONS

CERDELGA is contraindicated in patients (all CYP2D6 metabolizer types) with:

- Hypersensitivities to this drug or to any ingredient in the formulation or component of the container. For a complete listing, see the DOSAGE FORMS, COMPOSITION and PACKAGING section of the product monograph.
- Rare hereditary problems of galactose intolerance, the Lapp lactase deficiency or glucose-galactose malabsorption

CERDELGA is contraindicated in the following patients based on CYP2D6 metabolizer status due to the risk of significantly increased eliglustat plasma concentrations, which may increase the risk of cardiac arrhythmias from prolongation of the PR, QTc and/or QRS cardiac intervals (see **WARNINGS AND PRECAUTIONS, Cardiovascular**):

### EMs

- Taking a strong or moderate CYP2D6 inhibitor concomitantly with a strong or moderate CYP3A inhibitor (see **DRUG INTERACTIONS**)
- Mild hepatic impairment and taking a strong or moderate CYP2D6 inhibitor (see **WARNINGS AND PRECAUTIONS, Hepatic/Biliary/Pancreatic, DOSAGE AND ADMINISTRATION** and **ACTION AND CLINICAL PHARMACOLOGY**)
- Mild hepatic impairment taking a strong CYP3A inhibitor (see **WARNINGS AND PRECAUTIONS, Hepatic/Biliary/Pancreatic, DOSAGE AND ADMINISTRATION** and **ACTION AND CLINICAL PHARMACOLOGY**)
- Moderate or severe hepatic impairment (see **WARNINGS AND PRECAUTIONS, Hepatic/Biliary/Pancreatic**)

### IMs

- Taking a strong or moderate CYP2D6 inhibitor concomitantly with a strong or moderate CYP3A inhibitor (see **DRUG INTERACTIONS**)
- Taking a strong CYP3A inhibitor (see **WARNINGS AND PRECAUTIONS, Cardiovascular** and **DRUG INTERACTIONS**)
- Any degree of hepatic impairment (see **WARNINGS AND PRECAUTIONS, Hepatic/Biliary/Pancreatic, DOSAGE AND ADMINISTRATION** and **ACTION AND CLINICAL PHARMACOLOGY**)

## PMs

- Taking a strong CYP3A inhibitor (see **WARNINGS AND PRECAUTIONS, Cardiovascular** and **DRUG INTERACTION**)
- Any degree of hepatic impairment (see **WARNINGS AND PRECAUTIONS, Hepatic/Biliary/Pancreatic, DOSAGE AND ADMINISTRATION** and **ACTION AND CLINICAL PHARMACOLOGY**)

## **WARNINGS AND PRECAUTIONS**

### **General**

#### *Drug-drug interactions*

CERDELGA is a CYP2D6 and CYP3A substrate. Drugs that inhibit CYP2D6 and CYP3A metabolism pathways can significantly increase the exposure to eliglustat, which has the potential to lead to prolongation of the PR, QTc, and/or QRS ECG intervals and possibly result in cardiac arrhythmias (see **ACTIONS AND CLINICAL PHARMACOLOGY**).

CERDELGA is contraindicated in patients who are CYP2D6 IMs or EMs, taking a strong (e.g., paroxetine, fluoxetine, quinidine) or moderate (e.g. duloxetine, terbinafine) CYP2D6 inhibitor **concomitantly** with a strong (e.g., clarithromycin, itraconazole) or moderate (e.g., erythromycin, fluconazole) CYP3A inhibitor, and in patients who are CYP2D6 PMs or IMs, taking a strong CYP3A inhibitor. Under these conditions both major metabolic pathways for CERDELGA metabolism are impaired, with predicted substantially elevated eliglustat plasma concentrations (see **WARNINGS AND PRECAUTIONS, Cardiovascular, DOSAGE AND ADMINISTRATION** and **DRUG INTERACTIONS**).

Cerdelga is not recommended in EMs, IMs, or PMs when co-administered with certain CYP2D6 and/or CYP3A inhibitors (see **DOSAGE AND ADMINISTRATION** and **DRUG INTERACTIONS**).

Use of CERDELGA with strong CYP3A inducers substantially decreases the exposure to CERDELGA, which may reduce the therapeutic effectiveness of CERDELGA; therefore, concomitant administration is not recommended (see **DRUG INTERACTIONS** and **DOSAGE AND ADMINISTRATION**).

### **Cardiovascular**

#### *Electrocardiogram (ECG) Changes and Potential for Cardiac Arrhythmias*

CERDELGA is predicted to cause concentration-related increases in ECG intervals (PR, QTc, and QRS) (see **WARNINGS AND PRECAUTIONS, Monitoring and Laboratory Tests**,

**DRUG INTERACTIONS, and ACTION AND CLINICAL PHARMACOLOGY, Electrocardiographic Evaluation).** Use of CERDELGA is not recommended in patients with pre-existing cardiac disease (e.g., congestive heart failure, ischemic heart disease, recent acute myocardial infarction, bradycardia, heart block, atrial or ventricular arrhythmia, long QT syndrome, presence of pathologic genetic variants affecting cardiac ion channels or regulatory proteins), electrolyte disturbances, (e.g., hypokalemia, hypomagnesemia, hypocalcemia) or conditions that can lead to electrolyte disturbances (e.g. eating disorders) and in combination with Class IA (e.g., quinidine, procainamide), Class IC (flecainide, propafenone) and Class III (e.g., amiodarone, sotalol) antiarrhythmic medications. Caution is recommended in patients with a history of syncope or a family history of sudden cardiac death at <50 years. Non-sustained supraventricular and ventricular arrhythmias, as well as second degree atrioventricular blocks (Mobitz I), were observed in clinical trials.

Use of CERDELGA in patients with pre-existing cardiac conditions has not been studied during clinical trials.

### **Hepatic/Biliary/Pancreatic**

Use of CERDELGA in patients with hepatic impairment as well as with concomitant CYP2D6 or CYP3A inhibitors can result in elevation of eliglustat plasma concentrations, with the magnitude of the effect depending on the degree of hepatic impairment, as well as the enzyme inhibited and the potency of the inhibitor (see **WARNINGS AND PRECAUTIONS, Cardiovascular** and **ACTION AND CLINICAL PHARMACOLOGY, Pharmacokinetics** and **Special Populations and Conditions**).

Based on CYP2D6 metabolizer status and under conditions of hepatic impairment and/or concomitant use of CYP2D6 or CYP3A inhibitors, CERDELGA is contraindicated or recommended for a dose reduction as follows:

### **EMs**

- CERDELGA is contraindicated in patients with (see **CONTRAINDICATIONS**):
  - Severe (Child-Pugh Class C) hepatic impairment
  - Moderate (Child-Pugh Class B) hepatic impairment
  - Mild (Child-Pugh Class A) hepatic impairment taking a strong or moderate CYP2D6 inhibitor or a strong CYP3A inhibitor
- A dosage adjustment is recommended in patients with mild hepatic impairment (see **DOSAGE AND ADMINISTRATION**)

### **IMs and PMs:**

- CERDELGA is contraindicated in patients with any degree of hepatic impairment (see **CONTRAINDICATIONS**).

## **Renal**

Use of CERDELGA in patients with renal impairment is based on the patient's CYP2D6 metabolizer status as follows (see **DOSAGE AND ADMINISTRATION** and **ACTION AND CLINICAL PHARMACOLOGY, Pharmacokinetics**):

### **EMs:**

- CERDELGA is not recommended in patients with end stage renal disease (ESRD) (estimated creatinine clearance less than 15 mL/min not on dialysis or requiring dialysis)
- No dosage adjustment is recommended in patients with mild, moderate or severe renal impairment (estimated creatinine clearance 15 mL/min or higher)

### **IMs and PMs:**

- CERDELGA is not recommended in patients with any degree of renal impairment

## **Special Populations**

### **Pregnant Women:**

There are no adequate or well-conducted studies with CERDELGA in pregnant women. Placental transfer of eliglustat and/or its metabolites were detected at trace amounts in nonclinical studies. Eliglustat displayed embryo/fetal toxicity in animal studies at high doses and exposures that were associated with maternal toxicity (see **TOXICOLOGY**). Avoid the use of CERDELGA during pregnancy.

### **Nursing Women:**

In non-clinical studies, eliglustat has been shown to pass in trace amounts into breast milk. It is not known whether CERDELGA is present in human milk. Because of the potential for serious adverse reactions from CERDELGA in nursing infants, a decision should be made whether to discontinue nursing or discontinue the drug, taking into account the importance of the drug to the lactating woman.

### **Pediatrics (< 18 years of age):**

Safety and effectiveness in pediatric patients have not been established.

### **Geriatrics (≥ 65 years of age):**

There were a limited number of patients aged 65 and over enrolled in clinical trials. As greater rates of hepatic, renal, and cardiac function impairment are observed in elderly patients, this patient population may be more sensitive to the effects of CERDELGA. Use with caution (see **WARNINGS AND PRECAUTIONS** and **DOSAGE AND ADMINISTRATION**).

### **Ultra-rapid metabolizers and indeterminate metabolizers:**

CERDELGA should not be used in patients who are CYP2D6 URM or indeterminate metabolizers (see **INDICATIONS AND CLINICAL USE**).

### **Monitoring and Laboratory Tests**

#### CYP2D6 metabolizer status

Before initiation of treatment with CERDELGA, patients must be genotyped for CYP2D6 to determine their CYP2D6 metabolizer status (predicted phenotype) (see **INDICATIONS AND CLINICAL USE** and **DOSAGE AND ADMINISTRATION**).

#### Electrocardiogram

If CERDELGA is administered to patients with baseline ECG abnormalities which might be exacerbated by the QTc, QRS, or PR interval prolonging effects of the drug, then ECG monitoring during treatment should be performed as clinically indicated.

ECG monitoring should also be considered if CERDELGA is used concomitantly with other QTc-, QRS-, or PR-interval prolonging drugs (see **WARNINGS AND PRECAUTIONS, Cardiovascular** and **DRUG INTERACTIONS**).

## **ADVERSE REACTIONS**

### **Adverse Drug Reaction Overview**

Based on the initial pooled clinical trial data representing 535 patient-years of treatment exposure in 393 adult patients, the most commonly reported adverse reactions with CERDELGA (occurring in  $\geq 5\%$  of patients) were headache and dizziness. The most frequently reported serious adverse event was syncope (1%). The most common adverse events leading to discontinuation of CERDELGA and/or withdrawal from the studies were ventricular tachycardia (1%) and (acute) myocardial infarction (1%).

### **Clinical Trial Adverse Drug Reactions**

*Because clinical trials are conducted under very specific conditions the adverse reaction rates observed in the clinical trials may not reflect the rates observed in practice and should not be compared to the rates in the clinical trials of another drug. Adverse drug reaction information from clinical trials is useful for identifying drug-related adverse events and for approximating rates.*

The adverse reaction profile of CERDELGA is based on two controlled studies, ENGAGE (GZGD02507) and ENCORE (GZGD02607). **Table 1** presents adverse reactions in patients receiving CERDELGA in the 9-month double-blind, randomized, placebo-controlled trial of 40



treatment-naïve patients (ENGAGE). Patients were between the ages of 16 and 63 on the date of the first dose of study drug, and included 20 males and 20 females.

**Table 1 - Summary of Treatment-Emergent Adverse Reactions (considered treatment-related by Investigator) in Treatment-Naïve Gaucher Disease Type 1 Patients receiving CERDELGA as compared to Patients receiving Placebo (ENGAGE Trial)**

Adverse Reaction MedDRA System Organ Class Preferred Term	CERDELGA (N=20)	Placebo (N=20)
	Patients n (%)	Patients n (%)
<b>Gastrointestinal disorders</b>		
Diarrhea	2 ( 10)	4 ( 20)
Abdominal pain	1 ( 5)	2 ( 10)
Flatulence	2 ( 10)	1 ( 5)
Gastritis	1 ( 5)	0 ( 0)
Nausea	1 ( 5)	0 ( 0)
Vomiting	1 ( 5)	0 ( 0)
<b>Nervous system disorders</b>		
Headache	1 ( 5)	3 ( 15)
Paresthesia	1 ( 5)	0 ( 0)
<b>Skin and subcutaneous tissue disorders</b>		
Acne	1 ( 5)	0 ( 0)
Skin lesion	1 ( 5)	0 ( 0)
<b>Eye disorders</b>		
Vitreous detachment	1 ( 5)	0 ( 0)
<b>General disorders and administration site conditions</b>		
Chest pain	1 ( 5)	0 ( 0)
Edema peripheral	1 ( 5)	0 ( 0)
<b>Metabolism and nutrition disorders</b>		
Decreased appetite	1 ( 5)	1 ( 5)
<b>Blood and lymphatic system disorders</b>		
Splenic hemorrhage	1 ( 5)	0 ( 0)
<b>Infections and infestations</b>		
Oral fungal infection	1 ( 5)	0 ( 0)
<b>Musculoskeletal and connective tissue disorders</b>		
Arthralgia	1 ( 5)	0 ( 0)
<b>Renal and urinary disorders</b>		
Dysuria	1 ( 5)	0 ( 0)
Hematuria	1 ( 5)	0 ( 0)

Table 2 presents adverse reactions in patients receiving CERDELGA in the 12-month open-label, randomized, CEREZYME® controlled trial of 159 patients previously treated with enzyme

replacement therapy (ERT), randomized 2:1 to receive CERDELGA or CEREZYME<sup>®</sup> (ENCORE Trial). Patients were between the ages of 18 and 69 on the date of the first dose of CERDELGA, and included 87 females and 72 males.

**Table 2 - Summary of Treatment-Emergent Adverse Reactions (considered treatment-related by Investigator) in Gaucher Disease Type 1 Patients Switching from Enzyme Replacement Therapy to CERDELGA as compared to Patients receiving CEREZYME<sup>®</sup> (ENCORE Trial)**

Adverse Reaction MedDRA System Organ Class Preferred Term	CERDELGA (N=106)	CEREZYME <sup>®</sup> (N=53)
	Patients n (%)	Patients n (%)
<b>Gastrointestinal disorders</b>		
Diarrhea	5 (5)	0 (0)
Dyspepsia	3 (3)	1 (2)
Gastroesophageal reflux disease	3 (3)	0 (0)
Nausea	3 (3)	0 (0)
Abdominal pain upper	2 (2)	0 (0)
Constipation	2 (2)	0 (0)
Dry mouth	2 (2)	0 (0)
Dysphagia	2 (2)	0 (0)
Flatulence	2 (2)	0 (0)
Abdominal distension	1 (1)	0 (0)
Abdominal pain	1 (1)	0 (0)
Eructation	1 (1)	0 (0)
Gastritis	1 (1)	0 (0)
Glossodynia	1 (1)	0 (0)
Esophageal pain	1 (1)	0 (0)
<b>Nervous system disorders</b>		
Headache	4 (4)	0 (0)
Somnolence	3 (3)	0 (0)
Dizziness	2 (2)	0 (0)
Tremor	2 (2)	0 (0)
Dysgeusia	1 (1)	0 (0)
Hypoesthesia	1 (1)	0 (0)
Hyposmia	1 (1)	0 (0)
Neuropathy peripheral	1 (1)	0 (0)
Paresthesia	1 (1)	0 (0)
Parosmia	1 (1)	0 (0)
<b>General disorders and administration site conditions</b>		
Fatigue	4 (4)	0 (0)
Asthenia	2 (2)	0 (0)
Chest pain	1 (1)	0 (0)
Thirst	1 (1)	0 (0)
<b>Musculoskeletal and connective tissue disorders</b>		
Arthralgia	4 (4)	0 (0)
Back pain	1 (1)	1 (2)

Adverse Reaction MedDRA System Organ Class Preferred Term	CERDELGA (N=106)	CEREZYME® (N=53)
	Patients n (%)	Patients n (%)
Pain in extremity	2 ( 2)	0 ( 0)
Bone pain	1 ( 1)	0 ( 0)
Tendon disorder	1 ( 1)	0 ( 0)
<b>Investigations</b>		
Blood folate decreased	2 ( 2)	0 ( 0)
Blood homocysteine increased	2 ( 2)	0 ( 0)
Mean cell hemoglobin increased	1 ( 1)	0 ( 0)
Nerve conduction studies abnormal	1 ( 1)	0 ( 0)
Weight decreased	1 ( 1)	0 ( 0)
Bone density decreased	1 ( 1)	0 ( 0)
<b>Blood and lymphatic system disorders</b>		
Splenomegaly	3 ( 3)	0 ( 0)
Thrombocytopenia	1 ( 1)	0 ( 0)
<b>Cardiac disorders</b>		
Palpitations	2 ( 2)	0 ( 0)
Atrioventricular block first degree	1 ( 1)	0 ( 0)
Atrioventricular block second degree	1 ( 1)	0 ( 0)
<b>Neoplasms benign, malignant and unspecified (incl cysts and polyps)</b>		
Neoplasm skin	1 ( 1)	0 ( 0)
Skin papilloma	1 ( 1)	0 ( 0)
<b>Respiratory, thoracic and mediastinal disorders</b>		
Throat irritation	2 ( 2)	0 ( 0)
Cough	1 ( 1)	0 ( 0)
<b>Hepatobiliary disorders</b>		
Cholelithiasis	1 ( 1)	0 ( 0)
Hepatomegaly	1 ( 1)	0 ( 0)
<b>Psychiatric disorders</b>		
Confusional state	1 ( 1)	0 ( 0)
<b>Reproductive system and breast disorders</b>		
Menstruation irregular	1 ( 1)	0 ( 0)
Polycystic ovaries	1 ( 1)	0 ( 0)
<b>Ear and labyrinth disorders</b>		
Tinnitus	1 ( 1)	0 ( 0)
<b>Injury, poisoning and procedural complications</b>		
Foreign body	1 ( 1)	0 ( 0)
<b>Renal and urinary disorders</b>		
Proteinuria	1 ( 1)	0 ( 0)
<b>Vascular disorders</b>		
Flushing	1 ( 1)	0 ( 0)

In a Phase 2 open-label, uncontrolled study (GZGD00304) with up to 4 years of treatment in 26 patients, the types and incidences of adverse reactions were similar to the ENGAGE and ENCORE studies.

Following completion of the extension periods from the uncontrolled Phase 2 study and Phase 3 clinical program, adverse reactions assessed as related to treatment were pooled from the primary analysis and uncontrolled extension periods of Trial 1 (ENGAGE), Trial 2 (ENCORE), the Phase 2 Study, and one supporting Phase 3b study, representing a total of 1400 patient-years of treatment exposure in 393 adult patients who received CERDELGA for a median treatment duration of 3.5 years (5 patients received CERDELGA for 9.3 years). The most commonly reported adverse reactions with CERDELGA (occurring in  $\geq 5\%$  of patients) were: dyspepsia (6%), headache (5%), abdominal pain upper (5%) and dizziness (5%). The most commonly reported serious adverse reaction was syncope (1%).

## **DRUG INTERACTIONS**

### **Overview**

In vitro, eliglustat is metabolized primarily by CYP2D6 and to a lesser extent by CYP3A. Eliglustat is also a substrate of P-glycoprotein (P-gp).

Drugs that inhibit CYP2D6 and CYP3A pathways may significantly increase the exposure and maximal concentration of eliglustat and result in prolongation of the PR, QTc, and/or QRS cardiac interval which could result in cardiac arrhythmias.

Use of CERDELGA with strong CYP3A inducers substantially decreases the exposure to eliglustat, which may reduce the therapeutic effectiveness of CERDELGA; therefore concomitant administration is not recommended.

Co-administration of CERDELGA with drugs that are substrates for P-gp or CYP2D6 may result in increased concentrations of the concomitant drug.

Caution should be observed if CERDELGA is used concomitantly with drugs that prolong the PR, QRS, and/or QTc intervals, or affect electrolyte levels, as pharmacodynamic interactions may result.

### **Drug-Drug Interactions**

#### **Effect of Other Drugs on the pharmacokinetics of CERDELGA**

##### **CYP2D6 and CYP3A Inhibitors**

Some inhibitors of CYP2D6 and CYP3A are contraindicated with CERDELGA depending on the patient's CYP2D6 metabolizer status (see **CONTRAINDICATIONS**). Some CYP2D6 and CYP3A inhibitors are not recommended for use with CERDELGA or may require dosing adjustment of CERDELGA, depending on the patient's CYP2D6 metabolizer status, to reduce the risk of potential significant adverse reactions (see **DOSAGE AND ADMINISTRATION**). Physiologic based pharmacokinetic (PBPK) Modelling was used to predict changes in exposure

and maximal concentrations in EMs with mild, hepatic impairment co-administered with CYP2D6 or CYP3A inhibitors in arriving at dosing recommendations in GD1 patients (see **CONTRAINDICATIONS, DOSAGE AND ADMINISTRATION Table 4, Table 5 and Table 6** and **DETAILED PHARMACOLOGY**).

#### Co-administration with CYP2D6 Inhibitors

In EMs (N=30/33 subjects) in a clinical trial, the  $C_{max}$  and  $AUC_{0-12}$  of eliglustat following administration of CERDELGA with paroxetine (a strong CYP2D6 inhibitor) 30 mg once daily increased 7.0-fold and 8.4-fold, respectively. The  $C_{max}$  and  $AUC_{0-12}$  of eliglustat after co-administration of CERDELGA with paroxetine in CYP2D6 EMs were 110 ng/mL and 847 hr\*ng/mL respectively.

#### Co-administration with CYP3A Inhibitors

In EMs (N=31/33 subjects) in a clinical trial, the  $C_{max}$  and  $AUC_{0-12}$  of eliglustat following co-administration of CERDELGA with ketoconazole (a strong CYP3A inhibitor) 400 mg once daily increased 4.0-fold and 4.4-fold, respectively. The  $C_{max}$  and  $AUC_{0-12}$  of eliglustat after co-administration of CERDELGA with ketoconazole in CYP2D6 EMs were 71.0 ng/mL and 501 hr\*ng/mL, respectively.

PBPK modeling/population PK modeling (Pop-PK) was used to arrive at increased exposure and maximal concentration estimates for CYP2D6 inhibitors or CYP3A inhibitors taken concomitantly with CERDELGA. The exposure and maximal concentration estimates were then used in arriving at dosing recommendations for these populations (see **CONTRAINDICATIONS, DOSAGE AND ADMINISTRATION Table 4, Table 5 and Table 6** and **DETAILED PHARMACOLOGY, Human Pharmacokinetics**).

### **CYP3A Inducers**

#### Co-administration with CYP3A inducers

Systemic exposures ( $C_{max}$  and  $AUC_{0-12}$ ) of eliglustat decreased by approximately 89% in CYP2D6 EMs (N=12) following co-administration of supra-therapeutic doses of CERDELGA 127 mg twice daily with rifampin (a strong CYP3A inducer) 600 mg PO once daily. Systemic exposures of eliglustat decreased by approximately 95% following co-administration of CERDELGA 84 mg twice daily with rifampin 600 mg PO once daily in CYP2D6 PMs (N=6). Use of CERDELGA with strong CYP3A inducers is not recommended in EMs, IMs, and PMs (see **DOSAGE AND ADMINISTRATION Table 4, Table 5 and Table 6** and **DETAILED PHARMACOLOGY, Human Pharmacokinetics**).

### **Co-administration with P-gp inhibitors**

The effect of P-gp inhibitors on the systemic exposure of eliglustat has not been studied clinically.

### **Effect of CERDELGA on the pharmacokinetics of other drugs**

CERDELGA is an inhibitor of CYP2D6 and P-gp.

Following supra-therapeutic multiple doses of CERDELGA 127 mg twice daily, systemic exposure of metoprolol (50 mg, single dose, a CYP2D6 substrate) increased compared to metoprolol administration alone. Mean  $C_{max}$  and  $AUC_{0-\infty}$  increased by 1.7- and 2.3-fold, respectively, in EMs and by 1.2- and 1.6-fold, respectively in IMs. The mean  $C_{max}$  and  $AUC_{0-\infty}$  of metoprolol after co-administration with CERDELGA in IMs were 144 ng/mL and 1460 hr\*ng/mL, respectively, and in EMs were 108 ng/mL and 719 hr\*ng/mL, respectively.

Following supra-therapeutic multiple doses of CERDELGA 127 mg twice daily in EMs and IMs or 84 mg twice daily in PMs, systemic exposures to digoxin (0.25 mg, single dose, P-gp substrate, with narrow therapeutic index) increased compared to digoxin administration alone. Mean  $C_{max}$  and  $AUC_{last}$  increased by 1.7- and 1.5-fold, respectively. The  $C_{max}$  and  $AUC_{last}$  of digoxin after co-administration were 1.89 ng/mL and 16.9 hr\*ng/mL in one IM subject, respectively, and mean values were 1.68 ng/mL and 13.3 hr\*ng/mL in EMs, respectively.

Co-administration of CERDELGA with drugs that are substrates for P-gp or CYP2D6 may result in increased concentrations of the concomitant drug (see Table 3 below).

**Table 3 - Established or Potential Drug-Drug Interactions with agents whose exposure may be increased by CERDELGA**

<b>Concomitant Drug Class: Drug Name</b>	<b>Ref</b>	<b>Effect</b>	<b>Clinical comment and alteration of dosing.</b>
P-gp Substrates (e.g. digoxin, colchicine, dabigatran, phenytoin, pravastatin)	CT	CERDELGA may increase P-gp substrate drug exposure and maximum concentrations	Measure serum digoxin concentrations before initiating CERDELGA. Reduce digoxin dose by 30% and continue monitoring.  Lower doses of other substances which are P-gp substrates may be required.
CYP2D6 Substrates such as certain antidepressants (tricyclic antidepressants, e.g. nortriptyline, amitriptyline, imipramine, and desipramine),  phenothiazines (e.g., perphenazine, chlorpromazine),  dextromethorphan and atomoxetine  metoprolol	CT	CERDELGA may increase CYP2D6 substrate drug exposure and maximum concentrations	Lower doses of medicinal products that are CYP2D6 substrates may be required and titrate to clinical effect. Monitor therapeutic drug concentrations, as indicated.

CT = Clinical Trial; Ref = Reference

For other clinical drug interactions, see **DETAILED PHARMACOLOGY, Human Pharmacokinetics**.

### **Pharmacodynamic Drug Interactions**

#### **Drugs that Prolong the PR Interval:**

CERDELGA has the potential to increase the PR interval in a concentration-related manner (see **WARNINGS AND PRECAUTIONS, ECG Changes and Potential for Cardiac Arrhythmias** and **ACTION AND CLINICAL PHARMACOLOGY, Electrocardiographic Evaluation**). Caution is recommended if CERDELGA is used concomitantly with other drugs that prolong the PR interval, including, but not limited to, certain antiarrhythmics, beta blockers, non-dihydropyridine calcium channel blockers, digitalis glycosides, sphingosine-1 phosphate receptor modulators, HIV protease inhibitors, somatostatin analogues, and glucagon-like peptide-1 analogues.

### Drugs that Prolong the QRS and/or QTc Interval:

CERDELGA has the potential to increase the QRS duration and QTc interval in a concentration-related manner (see **WARNING AND PRECAUTIONS, ECG Changes and Potential for Cardiac Arrhythmias** and **ACTION AND CLINICAL PHARMACOLOGY, Electrocardiographic Evaluation**). Concomitant use of CERDELGA with Class IA, IC, and III antiarrhythmics is not recommended. Caution should be observed if CERDELGA is used with other drugs that prolong the QTc and/or QRS intervals, including, but not limited to, the following: antipsychotics (e.g., chlorpromazine, pimozide, haloperidol, droperidol, risperidone, ziprasidone); antidepressants (e.g., fluoxetine, citalopram, venlafaxine, tricyclic/tetracyclic antidepressants e.g., amitriptyline, imipramine, maprotiline); opioids (e.g., methadone); macrolide antibiotics and analogues (e.g., erythromycin, clarithromycin, telithromycin, tacrolimus); quinolone antibiotics (e.g., moxifloxacin, levofloxacin, ciprofloxacin); pentamidine; antimalarials (e.g., quinine, chloroquine); azole antifungals (e.g., ketoconazole, fluconazole, voriconazole); domperidone; 5-hydroxytryptamine (5-HT)<sub>3</sub> receptor antagonists (e.g., ondansetron); tyrosine kinase inhibitors (e.g., sunitinib, nilotinib, vandetanib); histone deacetylase inhibitors (e.g., vorinostat); beta-2 adrenoceptor agonists (e.g., salmeterol, formoterol).

The above lists of potentially interacting drugs are not comprehensive. Current information sources should be consulted for newly approved drugs that prolong the QTc interval, the QRS duration, or the PR interval, as well as for older drugs for which these effects have recently been established.

### Drugs that Affect Electrolytes:

Caution is recommended if CERDELGA is used with drugs that have the potential to decrease electrolytes levels, including, but not limited to, loop, thiazide, and related diuretics, laxatives and enemas, amphotericin B, high dose corticosteroids, and proton pump inhibitors.

The above list of potentially interacting drugs is not comprehensive. Current information sources should be consulted for newly approved drugs that disrupt electrolytes, as well as for older drugs for which these effects have recently been established.

### Drug-Food Interactions

Grapefruit products contain one or more components that strongly inhibit CYP3A and can increase plasma concentrations of eliglustat. Consumption of grapefruit or its juice should be avoided while taking CERDELGA (see Table 4, Table 5, and Table 6 in **DOSAGE AND ADMINISTRATION**).

### Drug-Herb Interactions

Use of a strong CYP3A inducer (e.g. St. John's wort) with CERDELGA is not recommended in



IMs, EMs and PMs. The use of weak CYP3A inhibitors (e.g. goldenseal) is not recommended in PMs (see Table 4, Table 5 and Table 6 in **DOSAGE AND ADMINISTRATION**).

### **Drug-Laboratory Test Interactions**

Interactions with laboratory tests have not been established.

### **Drug-Lifestyle Interactions**

No formal studies have been conducted on the effects of CERDELGA on the ability to drive and use machines

## **DOSAGE AND ADMINISTRATION**

### **Dosing Considerations**

Therapy with CERDELGA should be initiated and supervised by a physician knowledgeable in the management of Gaucher disease.

Before initiation of treatment with CERDELGA, patients must be genotyped for CYP2D6 to determine the CYP2D6 metabolizer status (predicted phenotype). CERDELGA is indicated for patients who are CYP2D6 PMs, IMs or EMs, as determined by CYP2D6 genotype testing (see **INDICATIONS AND CLINICAL USE**).

CERDELGA should not be used in patients who are CYP2D6 URM or indeterminate metabolizers (see **INDICATIONS AND CLINICAL USE, Limitations of Use**).

For patients currently treated with imiglucerase, velaglucerase alfa, or taliglucerase alfa, CERDELGA may be administered 24 hours after the last dose of the previous ERT.

### **Recommended Dose and Dosage Adjustment**

The recommended dose of CERDELGA depends on CYP2D6 metabolizer status, as follows:

- CYP2D6 Extensive metabolizer (EM): CERDELGA dosage is 84 mg twice daily
- CYP2D6 Intermediate metabolizer (IM): CERDELGA dosage is 84 mg twice daily
- CYP2D6 Poor metabolizer (PM): CERDELGA dosage is 84 mg once daily

The recommended dose of CERDELGA also depends on concomitant medication use as well as hepatic and renal impairment as follows in Table 4, Table 5 and Table 6 (see **CONTRAINDICATIONS, WARNINGS AND PRECAUTIONS, Hepatic/Biliary/Pancreatic, Renal** and **DRUG INTERACTIONS**):

**Table 4 – Dosing Recommendations for CERDELGA Due to Drug-Drug Interactions with CYP Inhibitors and Inducers in CYP2D6 Extensive Metabolizers, Intermediate Metabolizers and Poor Metabolizers.**

Concomitant Drug Class: Drug Name	Dosing Recommendations		
	Extensive Metabolizers (EMs)	Intermediate Metabolizers (IMs)	Poor Metabolizers (PMs)
Strong CYP3A Inhibitors used concomitantly with Strong/Moderate CYP2D6 Inhibitors (e.g., ketoconazole+ paroxetine/terbinafine)	Contraindicated	Contraindicated	Contraindicated
Moderate CYP3A Inhibitors used concomitantly with Strong/ Moderate CYP2D6 Inhibitors (e.g., fluconazole+paroxetine/ terbinafine)			Not recommended
Strong CYP2D6 Inhibitors (e.g., paroxetine, fluoxetine, quinidine, bupropion)	Not recommended	Not recommended	84 mg CERDELGA once daily
Moderate CYP2D6 Inhibitors (e.g., terbinafine, duloxetine, moclobemide, mirabegron, cinacalcet, dronedarone)	84 mg CERDELGA once daily	84 mg CERDELGA once daily	84 mg CERDELGA once daily
Weak CYP2D6 Inhibitors (e.g. abiraterone, amiodarone, celecoxib, cimetidine, clobazam, cobicistat, desvenlafaxine, escitalopram, labetalol, lorcaserin, ritonavir, sertraline, vemurafenib)	84 mg CERDELGA twice daily	No data available <sup>a</sup>	84 mg CERDELGA once daily

Concomitant Drug Class: Drug Name	Dosing Recommendations		
	Extensive Metabolizers (EMs)	Intermediate Metabolizers (IMs)	Poor Metabolizers (PMs)
Strong CYP3A Inhibitors (e.g., ketoconazole, clarithromycin, itraconazole, cobicistat, indinavir, lopinavir, ritonavir, saquinavir, telaprevir, tipranavir, posaconazole, voriconazole, conivaptan, boceprevir)	84 mg CERDELGA once daily	Contraindicated	Contraindicated
Moderate CYP3A Inhibitors (e.g., fluconazole, erythromycin, ciprofloxacin, diltiazem, verapamil, aprepitant, atazanavir, darunavir, fosamprenavir, imatinib, cimetidine)	84 mg CERDELGA once daily	84 mg CERDELGA once daily	Not recommended
Weak CYP3A Inhibitors (e.g., ranitidine, amlopidine, fluvoxamine, goldenseal, isoniazid)	84 mg CERDELGA twice daily	No data available <sup>a</sup>	Not recommended
Strong CYP3A Inducers (e.g. rifampin, carbamazepine, phenobarbital, phenytoin, rifabutin)	Not recommended	Not recommended	Not recommended

<sup>a</sup>No clinical data provided to make a dosing recommendation

**Table 5 – Recommended Dose for CERDELGA Based on Presence and Severity of Hepatic and Renal Impairment Status by CYP2D6 Metabolizer Status**

Organ Dysfunction status	Dosing Recommendations		
	Extensive Metabolizers (EMs)	Intermediate Metabolizers (IMs)	Poor Metabolizers (PMs)
<b><u>Hepatic impairment status:</u></b> Without hepatic impairment	84 mg CERDELGA twice daily	84 mg CERDELGA twice daily	84 mg CERDELGA once daily
Mild Hepatic Impairment (Child-Pugh Class A)	84 mg CERDELGA once daily	Contraindicated	Contraindicated

<b>Organ Dysfunction status</b>	<b>Dosing Recommendations</b>		
	<b>Extensive Metabolizers (EMs)</b>	<b>Intermediate Metabolizers (IMs)</b>	<b>Poor Metabolizers (PMs)</b>
Moderate or Severe Hepatic Impairment (Child-Pugh Class B or C)	Contraindicated	Contraindicated	Contraindicated
<b>Renal impairment status (creatinine clearance [CrCl]):</b> Without renal impairment (eCrCl >80 mL/min)	84 mg CERDELGA twice daily	84 mg CERDELGA twice daily	84 mg CERDELGA once daily
Mild, Moderate or Severe Renal Impairment (eCrCl: ≥15-≤80 ml/min)	84 mg CERDELGA twice daily	Not recommended	Not recommended
End stage renal disease (ESRD) (eCrCl: <15 ml/min)	Not recommended	Not recommended	Not recommended

**Table 6– Dosing Recommendations for CERDELGA in Mild Hepatic Impaired Patients Due to Drug-Drug Interactions in CYP2D6 Extensive Metabolizers**

<b>Mild Hepatic Impairment+ Concomitant Drug Class: Drug Name</b>	<b>Dosing Recommendations</b>
	<b>Extensive Metabolizers (EMs)</b>
Mild hepatic impairment + Strong CYP2D6 Inhibitors (e.g., paroxetine, fluoxetine, quinidine, bupropion)	Contraindicated
Mild hepatic impairment + Moderate CYP2D6 Inhibitors (e.g., terbinafine, duloxetine, moclobemide, mirabegron, cinacalcet, dronedarone)	Contraindicated
Mild hepatic impairment + Weak CYP2D6 Inhibitors (e.g., ritonavir)	84 mg CERDELGA once daily
Mild hepatic impairment+Strong CYP3A Inhibitors (e.g., ketoconazole, clarithromycin, itraconazole, cobicistat, indinavir, lopinavir, ritonavir, saquinavir, telaprevir, tipranavir, posaconazole, voriconazole, conivaptan, boceprevir)	Contraindicated

Mild Hepatic Impairment+ Concomitant Drug Class: Drug Name	Dosing Recommendations
	Extensive Metabolizers (EMs)
Mild hepatic impairment+Moderate CYP3A Inhibitors (e.g., fluconazole, erythromycin, ciprofloxacin, diltiazem, verapamil, aprepitant, atazanavir, darunavir, fosamprenavir, imatinib, cimetidine)	84 mg CERDELGA once daily
Mild hepatic impairment+Weak CYP3A Inhibitors (e.g., ranitidine, amlodipine, fluvoxamine, goldenseal, isoniazid)	84 mg CERDELGA once daily

For additional information regarding CERDELGA hepatic and renal impairment and drug interactions, see **ACTION AND CLINICAL PHARMACOLOGY, Pharmacokinetics and Special Populations and Conditions** and **DETAILED PHARMACOLOGY (Table 13, Table 14 and Table 15)**.

### **Administration**

Swallow capsules whole, preferably with water, and do not crush, dissolve, or open the capsules. CERDELGA can be taken with or without food.

### **Dosing in Special Populations**

#### **Hepatic Impairment**

See Tables 5 and 6.

#### **Renal Impairment**

See Table 5.

#### **Geriatrics (≥ 65 years of age)**

A limited number of patients aged 65 and over were enrolled in clinical trials. As greater rates of hepatic, renal, and cardiac function impairment are observed in elderly patients, this patient population may be more sensitive to the effects of CERDELGA. Use with caution (see **WARNINGS AND PRECAUTIONS** and **DOSAGE AND ADMINISTRATION**).

### **Missed Dose**

If a dose of CERDELGA is missed, take the prescribed dose at the next scheduled time; do not double the next dose.

## OVERDOSAGE

The highest eliglustat plasma concentration experienced to date occurred in a single-dose, dose escalation study in healthy subjects, in a subject taking a dose equivalent to approximately 21 times the recommended dose for GD1 patients. At the time of the highest plasma concentration (59-fold higher than normal therapeutic conditions), the subject experienced dizziness marked by disequilibrium, hypotension, bradycardia, nausea, and vomiting.

In the event of acute overdose, the patient should be carefully observed (e.g., ECG monitoring) and given symptomatic and supportive treatment.

Hemodialysis is unlikely to be beneficial given that CERDELGA has a large volume of distribution (see **ACTION AND CLINICAL PHARMACOLOGY**).

For management of a suspected drug overdose, contact your regional Poison Control Centre.

## ACTION AND CLINICAL PHARMACOLOGY

### **Mechanism of Action**

Gaucher disease is caused by a deficiency of the lysosomal enzyme acid  $\beta$ -glucosidase. Acid  $\beta$ -glucosidase catalyzes the conversion of the sphingolipid glucocerebroside into glucose and ceramide. The enzymatic deficiency causes an accumulation of glucosylceramide (GL-1) primarily in the lysosomal compartment of macrophages, giving rise to foam cells or "Gaucher cells". Eliglustat is a specific inhibitor of glucosylceramide synthase ( $IC_{50} = 10$  ng/mL), and acts as a substrate reduction therapy for GD1.

### **Pharmacodynamics**

#### *Electrocardiographic evaluation*

In a randomised, double-blind, placebo- and positive-controlled, crossover ECG assessment study, healthy subjects (N=47) received single 168 mg and 672 mg doses of CERDELGA, producing mean  $C_{max}$  values of 16.7 ng/mL and 237 ng/mL, respectively, with upper range concentrations as high as 761 ng/mL. Of note, mean steady-state  $C_{max}$  values for eliglustat in patients with Gaucher disease receiving the recommended therapeutic doses are predicted to be approximately 25 ng/mL in extensive metabolisers and approximately 75 ng/mL in intermediate and poor metabolisers on the basis of a population pharmacokinetic model.

At the CERDELGA 168 mg single dose, there were statistically significant differences from placebo in baseline-adjusted mean QRS duration and PR interval, with maximum effects of 1.4 ms (90% CI 0.4, 2.3) for the QRS duration and 3.5 ms (90% CI 1.2, 5.8) for the PR interval. At

the CERDELGA 672 mg single dose, there were statistically significant differences from placebo in baseline-adjusted mean QTc interval, QRS duration, and PR interval, with maximum effects of 6.5 ms (90% CI 3.6, 9.3) for the QTcF interval, 4.2 ms (90% CI 3.1, 5.2) for the QRS duration, and 14.1 ms (90% CI 11.7, 16.6) for the PR interval.

Concentration-related increases were observed for the placebo corrected change from baseline in the PR, QRS, and QTc intervals. Based on a PK/PD model, from this single dose study in healthy subjects, the magnitude of ECG interval changes at ascending plasma concentrations is predicted to be as follows (Table 7):

**Table 7 - PK/PD Model-Predicted Values of Placebo-Corrected Change from Baseline in ECG Parameters at Mean Maximal Plasma Concentrations ( $C_{max}$ )**

<b>PBPK/Population PK Model-Predicted Mean <math>C_{max}</math> of Eliglustat (ng/mL) (CYP2D6 Phenotypes, Dose)</b>	<b>PR interval (ms) Mean (90% CI)</b>	<b>QTcF Interval (ms) Mean (90% CI)</b>	<b>QRS Duration (ms) Mean (90% CI)</b>
25 (CYP2D6 EM, CERDELGA 84 mg BID)	1.6 (0.5, 2.8)	0.4 (-1.0, 1.7)	0.4 (-0.3, 1.1)
75.2 (CYP2D6 PM, CERDELGA 84 mg QD)	3.4 (2.3, 4.6)	1.6 (0.3, 3.0)	1.0 (0.3, 1.7)
75.6 (CYP2D6 IM, CERDELGA 84 mg BID)	3.5 (2.3, 4.6)	1.7 (0.3, 3.0)	1.0 (0.3, 1.7)
87.4 (CYP2D6 EM, CERDELGA 84 mg BID + strong CYP3A inhibitor)	3.9 (2.7, 5.1)	2.0 (0.6, 3.3)	1.1 (0.4, 1.8)
163 (CYP2D6 IM, CERDELGA 84 mg BID + strong CYP2D6 inhibitor)	6.6 (5.4, 7.8)	3.9 (2.5, 5.2)	2.1 (1.4, 2.8)
321 (CYP2D6 PM, CERDELGA 84 mg QD + strong CYP3A inhibitor)	12.3 (11.0, 13.6)	7.8 (6.3, 9.4)	4.0 (3.3, 4.8)
337 (CYP2D6 IM, CERDELGA 84 mg BID + strong CYP3A inhibitor)	12.9 (11.5, 14.2)	8.2 (6.7, 9.8)	4.2 (3.5, 5.0)
507 (CYP2D6 EM, CERDELGA 84 mg BID + strong CYP3A inhibitor + strong CYP2D6 inhibitor)	19.0 (17.4, 20.6)	12.5 (10.6, 14.4)	6.3 (5.5, 7.1)
578 (CYP2D6 IM, CERDELGA 84 mg BID + strong CYP3A inhibitor + strong CYP2D6 inhibitor)	21.6 (19.8, 23.3)	14.3 (12.3, 16.4)	7.2 (6.3, 8.1)

BID = twice daily;  $C_{max}$  = maximum observed plasma concentration; IM = intermediate metabolizer; EM = extensive metabolizer; QD = once daily; PM = poor metabolizer.

In the consideration of multiple dose data, the results of a multiple ascending-dose, randomised, double-blind, placebo-controlled study in healthy subjects are also presented. The study included cohorts of 12 subjects (N=8 active, N=4 placebo) who received CERDELGA at doses of 42 mg BID, 168 mg BID, or 294 mg BID or placebo for 12 days. During serial ECG assessments on day 12 of treatment, the observed maximum placebo-adjusted mean change from baseline in the QTcF interval was 9.6 ms (90% CI 5.3, 13.9) in the 42 mg BID cohort and 16.1 ms (90% CI 4.4, 27.9) in the 168 mg BID cohort, while the maximum placebo-adjusted mean change from baseline in the PR interval was 7.3 ms (90% CI 1.0, 13.5) in the 42 mg BID cohort and 8.3 ms (90% CI 2.3, 14.3) in the 168 mg BID cohort and the maximum placebo-adjusted mean change from baseline in the QRS duration was 5.4 ms (90% CI 4.4, 6.3) in the 42 mg BID group and 3.6 ms (1.0, 6.1) in the 168 mg BID group. A high discontinuation rate in the 294 mg BID group precluded informative ECG data for this dose (between 2 and 5 subjects on day 12).

ECG data from this study should be interpreted with the understanding that there was a small number of subjects analyzed at each dose in addition to high pharmacokinetic variability at each dose level (see **WARNINGS AND PRECAUTIONS, Cardiovascular** and **Monitoring and Laboratory Tests** and **DRUG INTERACTIONS, Pharmacodynamic Drug Interactions**).

### **Pharmacokinetics**

The systemic exposure ( $C_{max}$  and AUC) of eliglustat depends on the CYP2D6 phenotype. In healthy CYP2D6 EMs and IMs, CERDELGA pharmacokinetics is time-dependent and the systemic exposure increases in a more than dose proportional manner over the dose range of 42 to 127 mg twice daily. After multiple oral doses of 84 mg twice daily in EMs, steady state was reached in 4 days and eliglustat systemic exposure ( $AUC_{0-12}$ ) increased up to about 2-fold (accumulation ratio) at steady state compared to after the first dose ( $AUC_{0-\infty}$ ).

Oral dosing of CERDELGA 84 mg once daily has not been studied in PMs; however, the predicted systemic exposures in these patients are within the range of those observed in clinical studies. The pharmacokinetics of CERDELGA in CYP2D6 PMs is expected to be linear and time independent. Compared to EMs, the systemic exposure ( $AUC_{0-12}$ ) following 84 mg twice daily at steady state is 7.7-fold higher in PMs in healthy subjects and 2.6-fold higher in IMs in healthy subjects. Both  $AUC_{0-12}$  and  $C_{max}$  for eliglustat in GD1 EM and IM patients were 1.4-fold and 1.3-fold higher compared to healthy EM and IM subjects.



**Table 8 - Mean (Standard deviation) [Minimum – Maximum] PK exposures after multiple dosing of CERDELGA to healthy subjects and GD1 patients**

Population	Dose (mg, BID)	CYP2D6 Phenotype	C <sub>max</sub> (ng/mL)	AUC <sub>0-12</sub> (hr*ng/mL)
Healthy Subjects	84	EM (n=64)	19.5 (17.4) [2.67-68.4]	119 <sup>a</sup> (113) [21.2-503]
	84	IM (n=1)	44.6	306
	84	PM (n=6)	113 (36.1) [70.8-172]	922 (304) [609-1476]
GD1 Patients	84	EM (n=60)	28.1 (19.4) [3.48-91.6]	168 <sup>b</sup> (112) [30.6-662]
	84	IM (n=4)	58.7 (32.7) [40.4-108]	400 (286) [248-830]
	42	PM (n=5)	70.9 (37.4) [40.1-136]	583 (247) [323-992]

AUC<sub>0-12</sub> = area under the plasma concentration versus time curve from time zero to the end of the dosing interval (12 hours); BID = twice daily; C<sub>max</sub> = maximum observed plasma concentration; IM = intermediate metabolizer; EM = extensive metabolizer; PM = poor metabolizer

a. n=62

b. n=58

### Absorption:

In CYP2D6 EMs, median time to reach maximum plasma concentrations (t<sub>max</sub>) occurs at 1.5 to 2 hours following multiple doses of CERDELGA 84 mg twice daily. The corresponding mean C<sub>max</sub> values were 19.5 ng/mL and 28.1 ng/mL in EM healthy subjects and EM GD1 patients respectively. Their respective mean AUC<sub>0-12</sub> values were 119 hr\*ng/mL and 168 hr\*ng/mL in EM healthy subjects and EM GD1 patients respectively. The C<sub>max</sub> and AUC<sub>0-12</sub> in one IM healthy subject receiving multiple doses of CERDELGA 84 mg two time daily was 44.6 ng/mL and 306 hr\*ng/mL, respectively. The mean C<sub>max</sub> and AUC<sub>0-12</sub> in four IM GD1 patients were 58.7 ng/mL and 400 hr\*ng/mL, respectively. The oral bioavailability is low in EMs (<5%) following a single dose of CERDELGA 84 mg due to significant first-pass metabolism.

In PMs, median t<sub>max</sub> occurs at 3 hours following multiple doses of CERDELGA 84 mg twice daily. The corresponding mean C<sub>max</sub> and AUC<sub>0-12</sub> values were 113 ng/mL and 922 hr\*ng/mL, respectively.

Oral dosing of CERDELGA 84 mg once daily has not been studied in PMs. The predicted C<sub>max</sub> and AUC<sub>0-24hr</sub> in PMs using PBPK model with 84 mg once daily are 75 ng/mL and 956 hr\*ng/mL, respectively.

Administration of CERDELGA with a high fat meal resulted in a 15% decrease in C<sub>max</sub> but no change in AUC<sub>0-∞</sub>. Food does not have a clinically relevant effect on CERDELGA pharmacokinetics.

**Distribution:**

Eliglustat is moderately bound to human plasma proteins (76 to 83%). In the blood, it is mainly distributed in plasma and not red blood cells. After intravenous administration, the volume of distribution was 835 L in CYP2D6 EMs, suggesting wide distribution to tissues in humans.

**Metabolism:**

Eliglustat is extensively metabolized with high clearance, mainly by CYP2D6 and to a lesser extent CYP3A. Primary metabolic pathways of eliglustat involve sequential oxidation of the octanoyl moiety followed by oxidation of the 2,3-dihydro-1,4-benzodioxane moiety, or a combination of the two pathways, resulting in 21 oxidative metabolites. No active metabolites have been identified that are expected to contribute to the pharmacological activity of CERDELGA.

**Excretion:**

After oral administration of 84 mg [<sup>14</sup>C]-eliglustat, the majority of the administered dose is excreted in urine (41.8%) and feces (51.4%), mainly as metabolites. After intravenous administration in healthy volunteers, eliglustat total body clearance was 88 L/h in CYP2D6 EMs (CERDELGA is only for oral use). After repeated oral doses of 84 mg CERDELGA twice daily, eliglustat elimination half-life is approximately 6.5 hours in CYP2D6 EMs and 8.9 hours in PMs.

**Special Populations and Conditions****Pediatrics**

Safety and effectiveness in pediatric patients have not been established.

**Geriatrics**

Clinical studies of CERDELGA did not include sufficient numbers of subjects aged 65 and over to determine whether they respond differently from younger subjects (see **WARNINGS AND PRECAUTIONS** and **DOSAGE AND ADMINISTRATION**).

**Bodyweight/ Gender/Race**

Based on the population pharmacokinetic analysis, body weight, gender and race had limited or no impact on the pharmacokinetics of CERDELGA.

### **Hepatic Insufficiency**

Effects of mild and moderate hepatic impairment were evaluated in a single dose phase 1 study. After a single 84 mg dose, eliglustat  $C_{max}$  AUC were 1.22 and 1.15-fold higher in CYP2D6 EMs with mild hepatic impairment, and 2.81- and 5.16-fold higher in CYP2D6 EMs with moderate hepatic impairment compared to healthy CYP2D6 EMs. After repeated 84 mg twice daily doses of CERDELGA,  $C_{max}$  and  $AUC_{0-12}$  are predicted to be 2.38- and 2.85 fold higher in CYP2D6 EMs with mild hepatic impairment and 6.41- and 8.86-fold higher in CYP2D6 EMs with moderate hepatic impairment compared to healthy EMs.

Steady state PK exposure could not be predicted in CYP2D6 IMs and PMs with mild and moderate hepatic impairment due to limited or no single-dose data. The effect of severe hepatic impairment was not studied in subjects with any CYP2D6 phenotype (see **WARNINGS AND PRECAUTIONS, CONTRAINDICATIONS** and **DOSAGE AND ADMINISTRATION**).

Dosing adjustment is required in EMs with mild hepatic impairment. Contraindication or dose adjustment is required when CERDELGA is co-administered with CYP2D6 or CYP3A inhibitors, depending on the strength of the CYP2D6 or CYP3A inhibitor co-administered (see **DOSAGE AND ADMINISTRATION, CONTRAINDICATIONS, DRUG INTERACTIONS** and **DETAILED PHARMACOLOGY**)

### **Renal Insufficiency**

The effect of severe renal impairment was evaluated in a single dose phase 1 study. After a single 84 mg dose, eliglustat  $C_{max}$  and AUC decreased by 12% and 1% respectively, for CYP2D6 EMs with severe renal impairment and are comparable to the pharmacokinetic data of healthy CYP2D6 EMs. Limited or no data are available in patients with end stage renal disease (ESRD) and in CYP2D6 IMs or PMs with severe renal impairment (see **WARNINGS AND PRECAUTIONS** and **DOSAGE AND ADMINISTRATION**).

### **Genetic polymorphism**

#### *CYP2D6 phenotype*

Population pharmacokinetic analysis shows that the CYP2D6 predicted phenotype based on genotype is the most important factor affecting pharmacokinetic variability. Individuals with a CYP2D6 PM predicted phenotype (approximately 5 to 10% of the population) exhibit higher eliglustat concentrations than CYP2D6 IMs or EMs.

Dosing of CERDELGA 84 mg once daily has not been studied in PMs; however the predicted systemic exposures in these patients are within the range of those observed in clinical studies. Appropriate adverse event monitoring is recommended (see **ADVERSE REACTIONS** and **CLINICAL TRIALS**).

CERDELGA should not be used in patients who are CYP2D6 URM or indeterminate metabolizers (see **INDICATIONS AND CLINICAL USE**).

## **STORAGE AND STABILITY**

Store at 20°C to 25°C with excursions permitted between 15°C and 30°C.  
No protection from light and moisture is required.

## **DOSAGE FORMS, COMPOSITION AND PACKAGING**

CERDELGA 84 mg capsule for oral administration contains the following excipients: glyceryl behenate/glycerol dibehenate, hypromellose, lactose monohydrate, microcrystalline cellulose. The capsule shell is composed of gelatin, titanium dioxide (E171), yellow iron oxide (E172) and indigotine (E132). In the printing ink: shellac glaze, black iron oxide (E172), propylene glycol and ammonium hydroxide 28%.

CERDELGA is supplied as 84 mg hard gelatin capsules, with a blue-green opaque cap and white opaque body imprinted with “GZ02C” in black. Each 84 mg capsule of CERDELGA is equivalent to 100 mg of eliglustat tartrate (hemitartrate salt).

CERDELGA 84 mg capsules are supplied as:

- Carton of 14 capsules containing 1 pack (i.e., 1 inner carton). Each pack is composed of 1 blister card of 14 capsules and a cardboard wallet.
- Carton of 56 capsules containing 4 packs (i.e., 4 inner cartons). Each pack is composed of 1 blister card of 14 capsules and a cardboard wallet.

Not all pack sizes may be marketed.

## PART II: SCIENTIFIC INFORMATION

### PHARMACEUTICAL INFORMATION

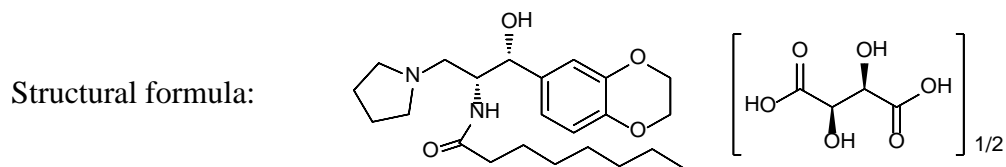
#### Drug Substance

Common name: Eliglustat tartrate

Chemical name: N-((1*R*,2*R*)-1-(2,3-dihydrobenzo[*b*][1,4]dioxin-6-yl)-1-hydroxy-3-(pyrrolidin-1-yl)propan-2-yl)octanamide (2*R*,3*R*)-2,3-dihydroxysuccinate

Molecular formula:  $C_{23}H_{36}N_2O_4 + \frac{1}{2}(C_4H_6O_6)$

Molecular mass: 479.59



Physicochemical properties:

White to off-white crystalline powder that is highly soluble in water.

## CLINICAL TRIALS

### Study demographics and trial design

**Table 9 - Summary of Patient Demographics for Clinical Trials in Specific Indication**

Study Name	Trial design	Dosage, route of administration and duration	Study subjects enrolled (n=number)	Median Age (range)	Gender
ENGAGE	Phase 3; Randomized, placebo- controlled  Treatment-naïve GD1 patients	CERDELGA, capsule (oral); 42 mg or 84 mg BID  Placebo  39 weeks	40 (20 on CERDELGA and 20 on placebo)  CERDELGA Treatment Group: IM (5%), EM (90%), URM (5%) patients	30 (16-63)	Male (50%) and female (50%)
ENCORE	Phase 3; Randomized, open-label, active comparator  Previously treated GD1 (stabilized with ERT)	CERDELGA Capsule (oral); 42 mg, 84 mg, or 127 mg BID  Cerezyme®, IV – variable doses based on patients' previous dose history  52 weeks	159 (106 on CERDELGA and 53 on CEREZYME)  CERDELGA Treatment Group: PM (4%), IM (10%), EM (80%), URM (4%) patients	37 (18-69)	Male (44%) and female (56%)
GZGD00304 (Phase 2)	Phase 2; Open-label  Treatment-naïve GD1 patients	CERDELGA Capsule (oral); 42 mg or 84 mg BID  48 months	26  CERDELGA Treatment Group: PM (4%), EM (96%) patients	31 (19-61)	Male (38%) and female (62%)

GD1=Gaucher Disease Type 1; ERT=Enzyme Replacement Therapy; BID=twice daily; IM=Intermediate Metaboliser; EM=Extensive Metaboliser; URM=Ultra Rapid Metaboliser; PM=Poor Metaboliser; IV= Intravenous

### Study results

#### **CERDELGA in Treatment-Naïve GD1 Patients – (ENGAGE Trial)**

The ENGAGE Trial was a randomized, double-blind, placebo-controlled, multi-centre clinical study in 40 patients with GD1. Patients were randomized in a 1:1 ratio to receive CERDELGA or placebo for the duration of the 9-month double-blinded primary analysis period. Patients presented with splenomegaly, anemia and /or thrombocytopenia, and were stratified according to baseline spleen volume ( $\leq 20$  or  $> 20$  multiples of normal [MN]). In the CERDELGA group, 3 (15%) patients received a dose of 42 mg CERDELGA twice daily during the 9-month primary analysis period and 17 (85%) patients received a dose escalation to 84 mg twice daily based on plasma trough concentration.

A summary of changes in organ volumes and hematological parameters in treatment-naïve patients from ENGAGE is shown in Table 10.

**Table 10 - Comparison of Organ Volume and Haematology Results from Treatment-Naïve Patients: ENGAGE**

	<b>CERDELGA (N=20)</b>	<b>Placebo** (N=20)</b>	<b>Difference (CERDELGA – Placebo) [95% CI]</b>	<b>p value*</b>
<b>Spleen Volume, mean (SD)</b>				
Baseline, MN	13.89 (5.93) [N=20]	12.50 (5.96) [N=20]		
9 Months, absolute change	-3.7 (2.38) [N=20]	0.4 (1.05) [N=20]	-4.1 [-5.3, -2.9]	Not tested
9 Months, % change (primary endpoint)	-27.58 (12.59) [N=20]	2.07 (8.78) [N=20]	-30.0 [-36.8, -23.2]	<0.0001
<b>Hemoglobin, mean (SD)</b>				
Baseline, g/dL	12.05 (1.19) [N=20]	12.75 (1.63) [N=20]		
9 Months, g/dL change (secondary endpoint)	0.73 (1.09) [N=20]	-0.58 (0.89) [N=20]	1.2 [0.6, 1.9]	0.0006
<b>Liver volume (MN), mean (SD)</b>				
Baseline, MN	1.44 (0.35) [N=20]	1.36 (0.28) [N=20]		
9 Months, absolute change	-0.1(0.11) [N=20]	0.0 (0.11) [N=20]	-0.1 [-0.2, 0.0]	Not tested
9 Months, % change (secondary endpoint)	-5.45 (6.89) [N=20]	1.70 (8.00) [N=20]	-6.6 [-11.4, -1.9]	0.0072
<b>Platelets, mean (SD)</b>				
Baseline, x10 <sup>9</sup> /L	75.05 (14.10) [N=20]	78.48 (22.61) [N=20]		
9 Months, absolute change	23.9 (22.60) [N=20]	-7.0 (15.39) [N=20]	31.3 [18.8, 43.8]	Not tested
9 Months, % change (secondary endpoint)	31.71 (31.80) [N=20]	-8.77 (19.19) [N=20]	41.1 [24.0, 58.2]	<0.0001

**MN =** Multiples of normal; **SD =** standard deviation

\* Estimates and p-value are based on ANCOVA model that includes treatment group, baseline spleen severity group ( $\leq 20$ MN,  $>20$ MN) and baseline parameter value.

\*\* All patients transitioned to CERDELGA treatment after Month 9

During the open-label long term period with CERDELGA (ENGAGE extension phase), the patients with complete data who continued to receive CERDELGA showed evidence of improvements throughout the extension phase. Results (change from baseline) after 18 months, 30 months and 4.5 years of exposure to CERDELGA are presented below:

**Table 11 – ENGAGE Results at 18 months, 30 months and 4.5 years**

Visit		Spleen Volume (MN)	Hemoglobin (g/dL)	Liver Volume (MN)	Platelet Count (mm <sup>3</sup> )
		% Change From Baseline	Change From Baseline	% Change From Baseline	% Change From Baseline
<b>18 months</b>	N	38	39	38	39
	Mean	-46.50%	1.1	-13.70%	58.50%
	SD	9.75%	1.03	10.65%	40.57%
<b>30 months</b>	N	32	35	32	35
	Mean	-54.20%	1.4	-18.50%	74.60%
	SD	9.51%	0.93	11.22%	49.57%
<b>4.5 years</b>	N	13	12	13	12
	Mean	-65.50%	1.4	-23.40%	86.80%
	SD	7.43%	1.31	10.59%	54.20%

### **Long-Term Clinical Outcomes in Treatment-Naïve GD1 patients – Phase 2 Study GZGD00304**

Study GZGD00304 (Phase 2) was a single-arm, open-label, multi-centre study of CERDELGA in 26 patients. Nineteen patients completed 4 years of treatment, and sixteen patients had an efficacy endpoint assessment at 8 years of treatment. Improvements from baseline in organ volume (spleen and liver) and hematological parameters (platelet count and haemoglobin level) were sustained through the 8 year treatment period.

### **CERDELGA in GD1 Patients Switching From ERT–ENCORE Trial**

The ENCORE Trial was a randomized, open-label, active-controlled, non-inferiority, multicenter clinical study evaluating the efficacy and safety of CERDELGA compared with CEREZYME<sup>®</sup> in 159 GD1 patients previously treated with enzyme replacement therapy who met pre-specified therapeutic goals.

Patients were randomized 2:1 to receive CERDELGA or CEREZYME<sup>®</sup> for the duration of the 12-month primary analysis period. Seventy-five percent of patients randomized to CERDELGA were previously treated with CEREZYME<sup>®</sup>; 21% with velaglucerase alfa and 4% were unreported. Patients randomized to CERDELGA treatment received a starting dose of 42 mg twice daily, with dose increases to 84 mg twice daily and 127 mg twice daily possible at Weeks 4 and 8 based on plasma trough concentrations of CERDELGA at Weeks 2 and 6, respectively.



The percentage of patients receiving the 3 possible CERDELGA doses was: 20% on 42 mg twice daily, 32% on 84 mg twice daily and 48% on 127 mg twice daily. The CERDELGA treatment group was comprised of PM (4%), IM (10%), EM (80%) and URM (4%) patients.

**Note:** The approved dosage of CERDELGA is 84 mg once daily (PMs) or twice daily (IMs or EMs) (see **DOSAGE AND ADMINISTRATION**).

The primary composite endpoint required stability in all four component domains (hemoglobin level, platelet count, liver volume, and spleen volume) based on changes between baseline and 12 months. Stability was defined by the following pre-specified thresholds of change: hemoglobin level <1.5 g/dL decrease, platelet count < 25% decrease, liver volume <20% increase and spleen volume <25% increase. The percentages of patients meeting the criteria for stability in the individual components of the composite endpoint were assessed as secondary efficacy endpoints.

CERDELGA met the criteria to be declared non-inferior to CEREZYME<sup>®</sup> in maintaining patient stability. After 12 months of treatment, the percentage of patients meeting the primary composite endpoint was 84.8% for the CERDELGA group compared to 93.6% for the CEREZYME<sup>®</sup> group. The lower bound of the 95% CI of the 8.8% difference, -17.6%, was within the pre-specified non-inferiority margin of -25%. At Month 12, the percentages of CERDELGA and CEREZYME<sup>®</sup> patients respectively, who met stability criteria for the individual components of the composite endpoint were: hemoglobin level, 94.9% and 100%; platelet count, 92.9% and 100%; spleen volume, 95.8% and 100%; and liver volume, 96.0% and 93.6%. Of the patients who did not meet stability criteria for the individual components, 12 of 15 CERDELGA patients and 3 of 3 CEREZYME<sup>®</sup> patients remained within therapeutic goals for GD1.

**Table 12 - Organ Volume and Hematology Results in Patients Switching from ERT in the ENCORE Trial**

	<b>CERDELGA (N=99)</b>	<b>CEREZYME® (N=47)*</b>
<b>Spleen Volume, mean (SD)</b>		
Baseline, MN	3.23 (1.37) [N=70]	2.63 (1.08) [N=39]
12 Months, absolute change	-0.16 (0.46) [N=70]	-0.10 (0.30) [N=39]
12 Months, % change (secondary endpoint)	-6.17 (14.14) [N=70]	-3.01 (10.50) [N=39]
<b>Hemoglobin, mean (SD)</b>		
Baseline, g/dL	13.59 (1.25) [N=98]	13.80 (1.22) [N=47]
12 Months, g/dL change (secondary endpoint)	-0.21 (0.71) [N=98]	0.04 (0.66) [N=47]
<b>Platelets, mean (SD)</b>		
Baseline, x10 <sup>9</sup> /L	206.75 (80.74) [N=98]	192.30 (57.34) [N=47]
12 Months, absolute change	9.53 (40.35) [N=98]	6.04 (23.73) [N=47]
12 Months, % change (secondary endpoint)	3.79 (18.85) [N=98]	2.93 (11.89) [N=47]
<b>Liver volume, mean (SD)</b>		
Baseline, MN	0.95 (0.19) [N=98]	0.91 (0.16) [N=47]
12 Months, absolute change	0.02 (0.09) [N=98]	0.03 (0.10) [N=47]
12 Months, % change (secondary endpoint)	1.78 (9.64) [N=98]	3.57 (10.24) [N=47]
<b>Percentage of Patients who Remained Stable for 52 Weeks: Composite Primary Endpoint</b>		
n/N (%)	83/99 (83.8)	44/47 (93.6)

ERT = enzyme replacement therapy; MN = multiples of normal; SD = standard deviation

\* All patients transitioned to CERDELGA treatment after Month 12

During the open-label long term treatment period with CERDELGA (ENCORE extension phase), 141 out of 146 patients (42 patients previously treated with enzyme replacement therapy and 99 who continued treatment with CERDELGA) were evaluated for stability (composite of spleen and liver volumes, hemoglobin level and platelet count as defined in the first 12 months of the trial). The percentage of patients with complete data meeting the composite stability endpoint was 84.6% (n=115/136) after 2 years, 84.4% (n=92/109) after 3 years and 91.1% (n=41/45) after 4 years. The majority of patients with available data showed stability in individual disease parameters (spleen volume, liver volume, hemoglobin level and platelet count) through 4 years.

## DETAILED PHARMACOLOGY

Glucosylceramide synthase is inhibited by eliglustat, with an *in vitro* IC<sub>50</sub> of approximately 10 ng/ml in both microsomes and intact human cells. *In vivo*, eliglustat significantly decreased GL-1 levels in peripheral tissues from normal rats and dogs and in mouse models of GD1 following well tolerated oral doses. These results provide proof-of-concept for eliglustat as a substrate reduction therapy.

Eliglustat resulted in a concentration-dependent suppression of hERG potassium currents and hNav1.5 sodium currents in HEK293 cells, with IC<sub>50</sub> values of 0.35 µg/mL and 5.2 µg/mL, respectively, based on nominal concentrations.

Eliglustat resulted in a concentration-dependent suppression of hCav1.2 L-type calcium currents in Chinese hamster ovary cells, with an IC<sub>50</sub> of 10.4 µg/mL based on nominal concentrations.

Conscious telemetered male dogs (N=4) were dosed with eliglustat by oral gavage according to an ascending dose regimen. Eliglustat at 1 to 80 mg/kg had no effect on arterial blood pressure or on QT, QTcF and QTcQ intervals. Eliglustat at 1 to 25 mg/kg had no effect on the PR interval. However, there was a tendency for prolongation of the PR interval with 50 and 80 mg/kg eliglustat, with maximum increases of 19.2 and 21 ms, respectively. Eliglustat at 1 and 3 mg/kg had no effect on QRS duration. However, a dose-dependent prolongation of the QRS duration versus vehicle was seen following administration of 10, 25, 50 and 80 mg/kg eliglustat, with maximum increases of 3.0, to 10.7 ms over this dose range.

Sodium pentobarbitone-anaesthetised dogs were dosed intravenously with escalating doses of 1, 2.5, and 5 mg/kg eliglustat (N=6) or vehicle (N=5) according to a parallel group design. At 2.5 mg/kg and 5 mg/kg eliglustat, dose-related increases were also seen in the PR interval (vehicle-adjusted mean change from baseline: 14.6 ± 8.7% and 24.7 ± 9.8%, respectively), the QTcF interval (vehicle-adjusted mean change from baseline: 4.5 ± 2.9% and 6.9 ± 4.9%, respectively), and the QRS duration (vehicle-adjusted mean change from baseline: 4.3 ± 4.6% and 13.3 ± 7.7%, respectively) at 5 min post-dose. Plasma levels of eliglustat at the end of each IV infusion were 2, 4.5, and 7.7 µg/mL for the 1, 2.5, and 5 mg/kg doses, respectively.

### Human Pharmacokinetics

#### **Effect of other drugs on the Pharmacokinetics of CERDELGA**

##### CYP2D6 and CYP3A inhibitors

Physiologic based pharmacokinetic modeling /Population PK modeling (PoP- PK) was used to arrive at increased exposure and maximal concentration estimates for CYP3A inhibitors or CYP2D6 inhibitors taken concomitantly with CERDELGA or strong/moderate CYP2D6 inhibitors used **concomitantly** with strong/moderate CYP3A inhibitors and CERDELGA. The exposure and maximal concentration estimates were then used in arriving at dosing

recommendations for these populations (see **DRUG INTERACTIONS** and **DOSAGE AND ADMINISTRATION**).

Co-administration of CERDELGA with strong/moderate CYP2D6 inhibitors used concomitantly with strong/moderate CYP3A inhibitors is contraindicated in CYP2D6 EM and IM subjects. There were 4.2-17-fold increases for  $C_{max}$  and 5.0-24-fold increases for  $AUC_{0-12}$ , after co-administration compared to CERDELGA administered alone in IM and EM subjects.

Co-administration of CERDELGA with strong CYP3A inhibitors is contraindicated in CYP2D6 IM and PM subjects. There were 4.3-4.4-fold increases for  $C_{max}$  (IM and PM), and 5.4 for  $AUC_{0-12}$  (IM) and 6.2 for  $AUC_{0-24}$  (PM), after co-administration, compared to CERDELGA administered alone.

**Table 13 - Observed or predicted effect of CYP2D6 and/or CYP3A inhibitors for CERDELGA doses of 84 mg BID and QD in CYP2D6 Extensive Metabolizer (EM) and Intermediate Metabolizer (IM) populations**

Concomitant Drug Class (Perpetrator)	Dose frequency (84 mg)	Ref	Extensive Metabolizers (EMs)			Intermediate Metabolizers (IMs)		
			C <sub>max</sub> (ng/mL)	AUC <sub>0-12</sub> (hr*ng/mL)	AUC <sub>0-24</sub> (hr*ng/mL)	C <sub>max</sub> (ng/mL)	AUC <sub>0-12</sub> (hr*ng/mL)	AUC <sub>0-24</sub> (hr*ng/mL)
Strong CYP2D6 Inhibitor + Strong CYP3A Inhibitor (paroxetine + ketoconazole)	BID	P	507	6163	-	578	7106	-
Moderate CYP2D6 Inhibitor + Moderate CYP3A Inhibitor (terbinafine + fluconazole)	BID	P	309	3488	-	321	3615	-
Strong CYP2D6 Inhibitor (paroxetine)	BID	CT/P	135	1168	-	163	1677	-
Moderate CYP2D6 Inhibitor (terbinafine)	BID	P	115	1149	-	119	1190	-
	QD	P	84.4	-	1126	86.7	-	1182
Weak CYP2D6 Inhibitor (ritonavir)	BID	P	42.1	361	-	81.3	753	-
Strong CYP3A Inhibitor (ketoconazole)	BID	CT/P	87.4	691	-	337	3917	-
	QD	P	46.9	-	576	181	-	3120
Moderate CYP3A Inhibitor (fluconazole)	BID	P	84.2	823	-	195	2062	-
	QD	P	38.7	-	434	108	-	1539
Weak CYP3A Inhibitor (fluvoxamine)	BID	P	48.4	415	-	105	976	-

AUC<sub>0-12</sub> = area under the plasma concentration versus time curve from time zero to the end of the dosing interval (12 hours for BID); AUC<sub>0-24</sub> = area under the plasma concentration versus time curve from time zero to the end of the dosing interval (24 hours for QD); BID = Twice daily; C<sub>max</sub> = maximum observed plasma concentration; CT = Clinical Trial; P = Physiologically-based pharmacokinetic prediction; QD = Once daily; Ref = Reference.

Scaling factors of 1.23 for C<sub>max</sub> and 1.38 for AUC<sub>0-12</sub> obtained from population PK analysis were applied to the clinical trial results and PBPK predicted values for GD1 patients

**Table 14 - Predicted effect of CYP3A and/or CYP2D6 inhibitors for CERDELGA doses of 84 mg QD in CYP2D6 Poor Metabolizer (PM) populations**

Concomitant Drug Class (Perpetrator)	Dose frequency (100 mg)	Ref	Poor Metabolizers (PMs)	
			C <sub>max</sub> (ng/mL)	AUC <sub>0-24</sub> (ng.h/mL)
Strong CYP2D6 Inhibitor + Strong CYP3A Inhibitor (paroxetine + ketoconazole)	QD	P	N/A <sup>a</sup>	N/A <sup>a</sup>
Moderate CYP2D6 Inhibitor + Moderate CYP3A Inhibitor (terbinafine + fluconazole)	QD	P	N/A <sup>a</sup>	N/A <sup>a</sup>
Strong CYP2D6 Inhibitor (paroxetine)	QD	P	N/A <sup>b</sup>	N/A <sup>b</sup>
Moderate CYP2D6 Inhibitor (terbinafine)	QD	P	N/A <sup>b</sup>	N/A <sup>b</sup>
Weak CYP2D6 inhibitor (ritonavir)	QD	P	N/A <sup>b</sup>	N/A <sup>b</sup>
Strong CYP3A Inhibitor (ketoconazole)	QD	P	321	5950
Moderate CYP3A Inhibitor (fluconazole)	QD	P	179	2820
Weak CYP3A Inhibitor (fluvoxamine)	QD	P	102	1290

AUC<sub>0-24</sub> = area under the plasma concentration versus time curve from time zero to the end of the dosing interval (24 hours for QD); QD = Once daily; C<sub>max</sub> = maximum observed plasma concentration; P = Physiologically-based pharmacokinetic prediction; Ref = Reference; N/A = Data not available

Scaling factors of 1.23 for C<sub>max</sub> and 1.38 for AUC<sub>0-12</sub> obtained from population PK analysis were applied to the PBPK predicted values for GD1 patients; a= Similar to or greater than that expected in the interaction with a strong/moderate CYP3A inhibitor alone as no drug interaction is expected with any CYP2D6 inhibitor due to little to no CYP2D6 activity in CYP2D6 PMs; b= No drug interaction is expected with any CYP2D6 inhibitor due to little to no CYP2D6 activity in CYP2D6 PMs.

*Mild hepatic impaired patients co-administered with CYP2D6 and CYP3A inhibitors*

Physiologic based pharmacokinetic modeling /Population PK modeling (Pop- PK) was used to arrive at increased exposure and maximal concentration estimates for CYP2D6 inhibitors or CYP3A inhibitors taken concomitantly with CERDELGA in EM patients with mild or moderate hepatic impairment.

Co-administration of CERDELGA with strong or moderate CYP2D6 inhibitors is contraindicated in CYP2D6 EM patients with mild hepatic impairment. There were approximately 2- 4 fold increases for C<sub>max</sub> and approximately 2-5 fold increases for AUC<sub>0-12</sub> after co-administration, compared to CERDELGA administered alone in EM patients with mild

hepatic impairment.

Co-administration of CERDELGA with strong CYP3A inhibitors is contraindicated in CYP2D6 EM patients with mild hepatic impairment. There were approximately 3-fold increases for  $C_{max}$  and approximately 4-fold increases for  $AUC_{0-12}$  after co-administration, compared to CERDELGA administered alone in EM patients with mild hepatic impairment.

**Table 15 - Observed or Predicted effect of CYP2D6 and/or CYP3A inhibitors for CERDELGA doses of 84 mg BID and QD in CYP2D6 Extensive Metabolizer (EM) hepatic impaired GD1 patient populations**

Hepatic Impairment status +inhibitor	Dosing frequency (84 mg)	Ref	C <sub>max</sub> (ng/mL)	AUC <sub>0-12</sub> (ng*h/mL)	AUC <sub>0-24</sub> (ng*h/mL)
Mild hepatic impairment	Single Dose	CT <sup>a</sup>	22.4	-	172 <sup>b</sup>
	BID	P	79.0	784	-
	QD	P	40.5	-	484
Moderate hepatic impairment	Single Dose	CT <sup>a</sup>	39.5	-	575 <sup>b</sup>
	BID	P	213	2434	-
	QD	P	103	-	1757
Mild hepatic impairment + strong CYP2D6 inhibitor (paroxetine)	BID	P	310	3621	-
Mild hepatic impairment + moderate CYP2D6 inhibitor (terbinafine)	BID	P	182	1972	-
Mild hepatic impairment + weak CYP2D6 inhibitor (ritonavir)	BID	P	107	1100	-
	QD	P	56.0	-	730
Mild hepatic impairment + strong CYP3A inhibitor (ketoconazole)	BID	P	253	3028	-
Mild hepatic impairment + moderate CYP3A inhibitor (fluconazole)	BID	P	178	2013	-
	QD	P	65.8	-	966
Mild hepatic impairment + weak CYP3A inhibitor (fluvoxamine)	BID	P	110	1132	-
	QD	P	52.2	-	665

AUC<sub>0-12</sub> = area under the plasma concentration versus time curve from time zero to the end of the dosing interval (12 hours for BID); AUC<sub>0-24</sub> = area under the plasma concentration versus time curve from time zero to the end of the dosing interval (24 hours for QD); BID = Twice daily; C<sub>max</sub> = maximum observed plasma concentration; CT = Clinical Trial; P = Physiologically-based pharmacokinetic prediction; QD = Once daily; Ref = Reference.

Scaling factors of 1.23 for C<sub>max</sub> and 1.38 for AUC<sub>0-12</sub> obtained from population PK analysis were applied to PBPK predicted values for GD1 patients

a. Clinical trial data in hepatic impaired patients administered single dose of eliglustat 84 mg.

b. Value represents AUC (area under the plasma concentration versus time curve from time zero to infinity) after single dose

### Effect of OATP (organic anion transporting polypeptide) Inhibitors on CERDELGA PK

Systemic exposures of eliglustat were similar with or without co-administration of CERDELGA



and a single 600 mg IV dose of rifampin (a potent OATP inhibitor), regardless of CYP2D6 phenotypes. The  $C_{max}$  and  $AUC_{last}$  after co-administration were 60.5 ng/mL and 611 hr\*ng/mL for CYP2D6 PMs (CERDELGA 84 mg with rifampin 600 mg), and were 22.6 ng/mL and 186 hr\*ng/mL for CYP2D6 EM/IMs (CERDELGA 127 mg with rifampin 600 mg) respectively.

#### Effect of Gastric pH-Modifying Agents on CERDELGA PK

Gastric pH-modifying agents (Maalox®, Tums®, Protonix®) did not have a clinically relevant effect on CERDELGA exposure.

Co-administration of Maalox®, Tums®, Protonix® with a single 84 mg dose of CERDELGA resulted in a 1.08-1.15-fold increase in  $C_{max}$  and 1.06-1.14-fold increase in  $AUC_{last}$  respectively compared to CERDELGA administered alone. After co-administration, the eliglustat  $C_{max}$  ranged from 8.10 to 9.06 ng/mL and  $AUC_{last}$  ranged from 61.8 to 68.7 hr\*ng/mL, respectively.

#### **Effect of CERDELGA on the pharmacokinetics of other drugs**

CERDELGA is an inhibitor of P-gp and CYP2D6. Co-administration of CERDELGA with drugs that are substrates for P-gp or CYP2D6 may result in increased concentrations of the concomitant drug (see **DRUG INTERACTIONS**).

*In vitro*, CERDELGA is a weak inhibitor of CYP3A. Repeated doses of CERDELGA 84 mg twice daily in CYP2D6 EM and PM population did not change the exposures to norethindrone (1.0 mg) and ethinyl estradiol (0.035 mg). The  $C_{max}$  and  $AUC_{last}$  after co-administration were 22.4 ng/mL and 147 hr\*ng/mL for norethindrone, and 138 pg/mL and 1160 hr\*pg/mL for ethinyl estradiol respectively. Therefore, CERDELGA is not expected to impact the efficacy or safety of oral contraceptives containing norethindrone and ethinyl estradiol.

## **TOXICOLOGY**

The principal target organs for eliglustat in toxicology studies are the GI tract, lymphoid organs, liver (rat only) and reproductive system (male rat only). Effects of eliglustat in toxicology studies were reversible and exhibited no evidence of delayed or recurring toxicity. Safety margins for the chronic rat and dog studies ranged between 8-fold and 15-fold.

Eliglustat did not have significant effects on CNS or respiratory functions.

#### Impairment of Fertility

In a fertility and early embryonic development study in rats, eliglustat increased pre-implantation loss at 30 mg/kg/day (about 1.5 times the recommended human oral dose based on body surface area) and 100 mg/kg/day (about 5 times the recommended human oral dose based on body surface area).

In mature male rats, eliglustat showed reversible adverse effects on sperm morphology, testes (germ cell necrosis), and sloughed cells in the epididymis at 200 mg/kg/day (about 10 times the recommended human oral dose based on body surface area). Similar effects on sperm were not seen in mature Cynomolgus monkeys at 72 mg/kg/day (about 7 times the recommended human oral dose based on body surface area).

Reproduction studies have been performed in pregnant rats at oral doses up to 120 mg/kg/day (about 6 times the recommended human dose based on body surface area) and in pregnant rabbits at oral doses up to 100 mg/kg/day (about 10 times the recommended human dose based on body surface area). In rats, at 120 mg/kg/day, eliglustat increased the number of late resorptions, dead fetuses and post implantation loss, reduced fetal body weight, and caused fetal cerebral variations (dilated cerebral ventricles), fetal skeletal variations (poor bone ossification) and fetal skeletal malformations (abnormal number of ribs or lumbar vertebra). Eliglustat did not cause fetal harm in rabbits at oral doses up to 100 mg/kg/day. In a pre and postnatal development study in rats, eliglustat did not show any significant adverse effects on pre and postnatal development at doses up to 100 mg/kg/day (about 5 times the recommended human dose based on body surface area).

In separate studies, placental transfer and milk excretion of eliglustat and/or its metabolites were detected at trace amounts in the rat.

### Carcinogenesis

Carcinogenic potential of eliglustat was assessed in 2-year carcinogenicity studies in rats and mice. In Sprague-Dawley rats, eliglustat was administered by oral gavage at doses up to 75 mg/kg/day in males (about 3.6 times the recommended human daily dose of 84 mg twice daily, based on body surface area) and 50 mg/kg/day in females (about 2.4 times the recommended human daily dose based on body surface area). In CD-1 mice, eliglustat was administered to males and females at up to 75 mg/kg/day (about 1.8 times the recommended human daily dose based on body surface area) via dietary admixture. Eliglustat did not produce any treatment-related neoplasms in rats or mice.

### Mutagenesis

Eliglustat was negative in the Ames test, chromosome aberration test in human peripheral blood lymphocytes, and in vivo oral mouse micronucleus test.

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PART III: PATIENT MEDICATION INFORMATION**

**CERDELGA™  
eliglustat capsules**

Read this carefully before you start taking **CERDELGA** 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 **CERDELGA**.

**What is CERDELGA used for?**

CERDELGA is a medicine used for treating adult patients with Gaucher disease type 1. CERDELGA is not used in certain people with Gaucher disease type 1. Your doctor will perform a test to make sure that CERDELGA is right for you. This test will tell how quickly your body breaks down (metabolizes) CERDELGA. It will also determine if and how you can use this medicine.

If your body metabolizes CERDELGA at a regular speed, you are an **extensive metabolizer**.

If your body metabolizes CERDELGA at a slower speed, you are an **intermediate metabolizer**.

If your body metabolizes CERDELGA at a very slow speed, you are a **poor metabolizer**.

**How does CERDELGA work?**

Gaucher disease type 1 is caused by not having the normal amount of an enzyme called acid  $\beta$ -glucosidase. This enzyme's job is to break down a lipid, or fatty substance, in your body called glucosylceramide. Because the level of this enzyme is lower in people with Gaucher disease, the lipid builds up in your body. The lipid build up can damage your organs, especially your liver and spleen. CERDELGA decreases the production of glucosylceramide which prevents its build-up. This helps the organs affected by Gaucher disease to work better.

Gaucher disease type 1 is a lifelong condition. You must continue to take CERDELGA as prescribed by your healthcare professional.

**What are the ingredients in CERDELGA?**

Medicinal ingredients: eliglustat tartrate

Non-medicinal ingredients: ammonium hydroxide, black iron oxide (E172), gelatin, glyceryl behenate/glycerol dibehenate, hypromellose, indigotine (E132), lactose monohydrate, microcrystalline cellulose, propylene glycol, shellac glaze, titanium dioxide (E171) and yellow iron oxide (E172).

## **CERDELGA comes in the following dosage forms:**

Capsules; 84 mg

Do not use CERDELGA if you:

- are allergic to eliglustat tartrate or any of the other ingredients of CERDELGA
- have one of the following rare hereditary conditions, because lactose is a non-medicinal ingredient in CERDELGA:
  - Galactose intolerance
  - Lapp lactase deficiency
  - Glucose-galactose malabsorption
- are an **extensive or intermediate metabolizer**, and
  - you are taking a combination of other medicines called **strong or moderate CYP2D6 inhibitors** with **strong or moderate CYP3A inhibitors**. The combination of these types of medicine will affect how you respond to CERDELGA.
- are an **intermediate or poor metabolizer**, and
  - you are taking medicines that are **strong CYP3A inhibitors**. Medicines of this type will affect how you respond to CERDELGA, or
  - you have liver problems.
- are an **extensive metabolizer** and you also have one of the following:
  - moderate to severe liver problems, or
  - mild liver problems and you are taking a **strong or moderate CYP2D6 inhibitor**, or
  - mild liver problems and you are taking a **strong CYP3A inhibitor**

Examples of **strong or moderate CYP2D6 inhibitors** are paroxetine, fluoxetine, quinidine, bupropion or terbinafine, duloxetine, moclobemide, mirabegron, cinacalcet and dronedarone.

Examples of **moderate CYP3A inhibitors** are cobicistat, indinavir, fluconazole, erythromycin, ciprofloxacin, diltiazem, verapamil, aprepitant, atazanavir, darunavir, fosamprenavir, imatinib and cimetidine.

Examples of **strong CYP3A inhibitors** are ketoconazole, clarithromycin, itraconazole, lopinavir, ritanovir, saquinavir, cobicistat, indinavir, telaprevir, tipranavir, posaconazole, voriconazole, conivaptan and boceprevir.

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

- Are currently taking, or are about to start taking any of the medicines described in section ‘The following may interact with CERDELGA’.
- Have heart problems.
- Have a history of a heart attack.
- Have a family history of sudden cardiac death before age 50 years.

- Have a history of fainting (syncope).
- Have an irregular or abnormal heart beat, including a heart condition called long QT syndrome.
- Have kidney or liver problems.
- Have an eating disorder.
- Have low blood levels of potassium, magnesium, or calcium.
- Are dehydrated or suffer from excessive vomiting, diarrhea or sweating.
- Are pregnant, think that you may be pregnant or are planning to become pregnant. You must talk to your healthcare professional about whether you can take CERDELGA while you are pregnant.
- Are breast-feeding or planning to breastfeed. It is not known if CERDELGA passes into your breast milk. You and your healthcare professional will decide if you should take CERDELGA or breastfeed. You should not do both.

**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 CERDELGA:**

CERDELGA must not be used with certain types of medicines. Some medicines can interfere with your body's ability to break down CERDELGA, resulting in higher levels of CERDELGA in your blood. These medicines are known as strong, moderate or weak CYP2D6 inhibitors and strong, moderate, or weak CYP3A inhibitors. Other medicines and herbs can also interact with CERDELGA.

**Especially tell your healthcare professional if you take:**

- St. John's wort (*Hypericum perforatum*), an herbal medicine used to treat depression.
- Goldenseal, an herbal medicine used to treat the common cold.
- Medicine to treat fungal infections (such as ketoconazole, fluconazole, terbinafine, itraconazole, posaconazole, voriconazole, amphotericin B)
- Medicine to treat bacterial infections (such as clarithromycin, erythromycin, ciprofloxacin, moxifloxacin, levofloxacin, telithromycin, tacrolimus)
- Medicine to treat malaria (such as quinine, chloroquine)
- Medicine to treat HIV infection and AIDS (such as cobicistat, indinavir, lopinavir, ritonavir, saquinavir, telaprevir, tipranavir, atazanavir, darunavir, fosamprenavir)
- Medicine to treat Hepatitis C infection (boceprevir)
- Medicine to treat tuberculosis (such as rifampin, isoniazid, rifabutin)
- Medicine to treat seizures (such as carbamazepine, phenobarbital, phenytoin)
- Medicine for heart conditions or high blood pressure (such as quinidine, dronedarone, diltiazem, verapamil, amlodipine, digoxin, metoprolol)
- Medicine to treat depression or other mental health problems (such as paroxetine, fluoxetine, bupropion, duloxetine, moclobemide, fluvoxamine, perphenazine, chlorpromazine, pimozide, haloperidol, droperidol, risperidone, ziprasidone, citalopram, venlafaxine, nortriptyline, amitriptyline, imipramine, desipramine, maprotiline, atomoxetine)

- Medicine to treat overactive bladder (such as mirabegron)
- Opioids (such as methadone)
- Domperidone, often used to increase milk supply in women who are breastfeeding
- Medicine to prevent nausea and vomiting (such as ondansetron, aprepitant)
- Medicine to treat cancer (imatinib, sunitinib, nilotinib, vandetanib, vorinostat)
- Medicine to treat breathing problems like asthma (such as salmeterol, formoterol)
- Diuretics or “water pills”
- Medicine to treat low levels of sodium in the blood (such as conivaptan)
- Medicine to treat problems with the parathyroid gland (such as cinacalcet)
- Medicine to treat gout (such as colchicine)
- Medicine to treat cough (such as dextromethorphan)
- Medicine to prevent stroke (such as dabigatran)
- Medicine to treat high cholesterol levels (such as pravastatin)
- Laxatives and enemas
- High dose corticosteroids used to treat inflammation and reduce the activity of the immune system
- Medicine used to treat ulcers (cimetidine, ranitidine)
- Medicine to treat heartburn and acid reflux (such as proton pump inhibitors)

If you take any medicines for the conditions listed above, your healthcare professional may need to prescribe a different medicine, change your dose of the other medicines, or change your dose of CERDELGA. Tell your healthcare professional about any new medicines before you start taking them.

Do not eat grapefruit or drink grapefruit juice since it may increase the level of CERDELGA in your blood.

**How to take CERDELGA:**

- Always take CERDELGA exactly as your healthcare professional has told you. Check with your healthcare professional if you are not sure.
- Continue taking CERDELGA every day for as long as your healthcare professional tells you.
- CERDELGA can be taken with or without food.
- Take CERDELGA at the same time each day.
- Swallow CERDELGA whole with water. Do not open, crush, dissolve, or chew the capsule. If you cannot swallow the capsule whole, tell your healthcare professional.

**Usual adult dose:**

Your healthcare professional will decide on the dose that is right for you. It may be either one or two CERDELGA capsules per day. This will be based on any other medicines you may be taking and blood tests to determine:

- the type of metabolizer you are (how quickly your body breaks down CERDELGA), and
- if you have kidney or liver problems.

**Overdose:**

If you think you have taken too much CERDELGA, contact your healthcare professional, hospital emergency department or regional Poison Control Centre immediately, even if there are no symptoms.

Symptoms of taking too much CERDELGA may include dizziness with loss of balance, slow heart rate, nausea, vomiting and light-headedness.

**Missed Dose:**

If you miss a dose take the next capsule at the usual time. Do not take a double dose to make up for a forgotten dose.

**What are possible side effects from using CERDELGA?**

These are not all the possible side effects you may feel when taking CERDELGA. If you experience any side effects not listed here, contact your healthcare professional.

Side effects may include:

- tiredness, sleepiness or drowsiness, low energy
- headache
- dizziness
- fainting
- nausea, diarrhea, gas, indigestion, constipation, stomach pain
- dry mouth, trouble swallowing
- tremor
- pain in the arms, legs or back

<b>Serious side effects and what to do about them</b>			
Symptom / effect	Talk to your healthcare professional		Stop taking drug and get immediate medical help
	Only if severe	In all cases	
<b>RARE</b> <b>Changes in the electrical activity of your heart (ECG changes):</b> palpitations, irregular heartbeat,			√

Serious side effects and what to do about them			
Symptom / effect	Talk to your healthcare professional		Stop taking drug and get immediate medical help
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dizziness, fainting			

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

<p><b>Reporting Side Effects</b>  You can report any suspected side effects associated with the use of health products to Health Canada by:</p> <ul style="list-style-type: none"> <li>• Visiting the Web page on Adverse Reaction Reporting (<a href="https://www.canada.ca/en/health-canada/services/drugs-health-products/medeffect-canada/adverse-reaction-reporting.html">https://www.canada.ca/en/health-canada/services/drugs-health-products/medeffect-canada/adverse-reaction-reporting.html</a>) for information on how to report online, by mail or by fax; or</li> <li>• Calling toll-free at 1-866-234-2345.</li> </ul> <p><i>NOTE: Contact your healthcare professional if you need information about how to manage your side effects. The Canada Vigilance Program does not provide medical advice.</i></p>
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**Storage:**

Keep out of reach and sight of children.

Store at 20°C to 25°C with excursions permitted between 15°C and 30°C.

Do not use this medicine after the expiry date which is stated on the carton, sleeve and blister after 'EXP'. The expiry date refers to the last day of that month.

**If you want more information about CERDELGA:**

- 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.html>); the manufacturer's website [www.genzyme.ca](http://www.genzyme.ca), or by calling 1-877-220-8918.

This leaflet was prepared by Sanofi Genzyme, a division of sanofi-aventis Canada Inc.

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