

PRODUCT MONOGRAPH  
INCLUDING PATIENT MEDICATION INFORMATION

**PrTAKHZYRO™**

lanadelumab injection

150 mg/mL Solution for Subcutaneous Injection

Monoclonal antibody inhibitor of plasma kallikrein

ATC code: B06AC05

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## RECENT MAJOR LABEL CHANGES

None

## TABLE OF CONTENTS

<b>RECENT MAJOR LABEL CHANGES</b> .....	<b>2</b>
<b>TABLE OF CONTENTS</b> .....	<b>2</b>
<b>PART I: HEALTH PROFESSIONAL INFORMATION</b> .....	<b>4</b>
<b>1 INDICATIONS</b> .....	<b>4</b>
1.1 Pediatrics .....	4
1.2 Geriatrics .....	4
<b>2 CONTRAINDICATIONS</b> .....	<b>4</b>
<b>3 DOSAGE AND ADMINISTRATION</b> .....	<b>4</b>
3.1 Recommended Dose and Dosage Adjustment .....	4
3.2 Administration .....	4
3.3 Missed Dose .....	5
<b>4 OVERDOSAGE</b> .....	<b>5</b>
<b>5 DOSAGE FORMS, STRENGTHS, COMPOSITION AND PACKAGING</b> .....	<b>5</b>
<b>6 WARNINGS AND PRECAUTIONS</b> .....	<b>6</b>
6.1 Special Populations .....	6
6.1.1 Pregnant Women .....	6
6.1.2 Breast-feeding .....	6
6.1.3 Pediatrics .....	7
6.1.4 Geriatrics .....	7
<b>7 ADVERSE REACTIONS</b> .....	<b>7</b>
7.1 Adverse Reaction Overview .....	7
7.2 Clinical Trial Adverse Reactions .....	7
7.3 Clinical Trial Adverse Reactions (Pediatrics) .....	9
7.4 Post-Market Adverse Reactions .....	9
<b>8 DRUG INTERACTIONS</b> .....	<b>9</b>
8.1 Drug-Drug Interactions .....	9
8.2 Drug-Food Interactions .....	9
8.3 Drug-Food Interactions .....	9
8.4 Drug-Laboratory Test Interactions .....	9
<b>9 ACTION AND CLINICAL PHARMACOLOGY</b> .....	<b>9</b>
9.1 Mechanism of Action .....	9
9.2 Pharmacodynamics .....	10
9.3 Pharmacokinetics .....	10
9.3.1 Special Populations .....	10
9.3.2 Concomitant Medications .....	11
<b>10 STORAGE, STABILITY AND DISPOSAL</b> .....	<b>11</b>
<b>11 SPECIAL HANDLING INSTRUCTIONS</b> .....	<b>11</b>

<b>PART II: SCIENTIFIC INFORMATION .....</b>	<b>12</b>
<b>12 PHARMACEUTICAL INFORMATION.....</b>	<b>12</b>
<b>13 CLINICAL TRIALS.....</b>	<b>13</b>
13.1 Trial Design and Results .....	13
13.1.1 Pivotal Study.....	13
13.1.2 Long Term Study .....	16
<b>14 NON-CLINICAL TOXICOLOGY .....</b>	<b>16</b>
14.1 General Toxicology .....	16
14.2 Carcinogenicity.....	16
14.3 Genotoxicity .....	16
14.4 Reproductive and Developmental Toxicology.....	16
<b>PATIENT MEDICATION INFORMATION .....</b>	<b>18</b>

## PART I: HEALTH PROFESSIONAL INFORMATION

### 1 INDICATIONS

TAKHZYRO (lanadelumab injection) is indicated for routine prevention of attacks of hereditary angioedema (HAE) in adolescents and adults.

TAKHZYRO is not intended for acute treatment of HAE attacks.

#### 1.1 Pediatrics

**Adolescents (≥12 years):** The safety and efficacy of TAKHZYRO were evaluated in subjects 12 to 17 years of age (n=23). Results of the subgroup analysis by age were consistent with overall study results (See 7.3 Clinical Trial Adverse Reactions (Pediatrics), 9.3 Pharmacokinetics, and 13 CLINICAL TRIALS).

**Pediatrics (<12 years):** The safety and efficacy of TAKHZYRO in pediatric patients < 12 years of age have not been studied.

#### 1.2 Geriatrics

**Geriatrics (≥ 65 years of age):** The safety and efficacy of TAKHZYRO were evaluated in subjects 65 years of age and older (n=11). Results of the subgroup analysis by age were consistent with overall study results (see 9.3 Pharmacokinetics and 13 CLINICAL TRIALS).

### 2 CONTRAINDICATIONS

TAKHZYRO (lanadelumab injection) is contraindicated in patients who are hypersensitive to this drug or to any ingredient in the formulation, including any non-medicinal ingredient, or component of the container. For a complete listing, see 5 DOSAGE FORMS, STRENGTHS, COMPOSITION AND PACKAGING.

### 3 DOSAGE AND ADMINISTRATION

#### 3.1 Recommended Dose and Dosage Adjustment

The recommended dose of TAKHZYRO is 300 mg every 2 weeks. A dosing interval of 300 mg every 4 weeks may be considered if the patient is well-controlled (e.g., attack free) for more than 6 months.

#### 3.2 Administration

TAKHZYRO is administered subcutaneously only.

TAKHZYRO is provided as a ready-to-use solution in a single-use vial that does not require additional reconstitution or dilution for administration. TAKHZYRO is supplied as a colourless to slightly yellow solution, appearing either clear or slightly opalescent. Do not use the vial if the solution appears discoloured or contains visible particles. Avoid vigorous agitation of the vial.

TAKHZYRO is intended for use under the guidance of a healthcare professional. After proper training in subcutaneous injection technique, a patient may self-inject TAKHZYRO, or the

patient's caregiver may administer TAKHZYRO, if their healthcare professional determines that it is appropriate.

Remove the TAKHZYRO vial from the refrigerator approximately 15 minutes before injecting to allow the solution to come to room temperature.

Using aseptic technique, withdraw the prescribed dose of TAKHZYRO from the vial using an 18 gauge needle. Change the needle on the syringe to a 27 gauge ½-inch pointed tip needle or other needle suitable for subcutaneous injection. Inject TAKHZYRO subcutaneously into the abdomen, thigh, or upper arm. Patients should inject the complete dose as prescribed by their health professional.

TAKHZYRO should be administered within 2 hours of preparing the dosing syringe at room temperature. After the dosing syringe is prepared, it can be refrigerated (2 °C to 8°C) but must be used within 8 hours.

Discard any unused portions of the drug remaining in the vial and syringe.

For detailed instructions on the preparation and administration of TAKHZYRO see **PATIENT MEDICATION INFORMATION**.

### 3.3 Missed Dose

If a dose of TAKHZYRO is missed, instruct the patient to administer the dose as soon as possible ensuring at least 10 days between doses.

## 4 OVERDOSAGE

There is no clinical experience with overdosage of TAKHZYRO. The highest dose tested in clinical trials was 400 mg.

For management of a suspected drug overdose, contact your regional poison control centre.
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## 5 DOSAGE FORMS, STRENGTHS, COMPOSITION AND PACKAGING

**Table 1. Dosage Forms, Strengths, Composition and Packaging**

Route of Administration	Dosage Form / Strength/Composition	Non-medicinal Ingredients
Subcutaneous	<ul style="list-style-type: none"><li>300 mg /2 mL solution</li></ul> Each mL of solution contains 150 mg of lanadelumab	citric acid monohydrate, L-histidine, polysorbate 80, sodium chloride, sodium phosphate dibasic dihydrate, water for injection.

### Dosage Form Description

TAKHZYRO (lanadelumab injection) is a non-plasma derived, recombinant, fully human, monoclonal antibody (IgG1/ κ-light chain) produced in Chinese Hamster Ovary (CHO) cells using recombinant DNA technology.

TAKHZYRO is a sterile, preservative-free solution in a single-use glass vial.

### Packaging

TAKHZYRO is a ready-to-use solution supplied in an individual packaged glass vial with chlorobutyl rubber stopper, aluminum crimp seal and polypropylene flip-off cap. Each vial contains a slight overfill. Each carton contains one vial.

## **6 WARNINGS AND PRECAUTIONS**

### **General**

TAKHZYRO (lanadelumab injection) should not be used to treat an acute attack. Patients and caregivers should continue to be prepared to treat attacks with acute HAE treatments when necessary.

### **Driving and Operating Machinery**

Patients should be advised not to drive or operate machinery if they feel dizzy after use.

### **Hypersensitivity**

Hypersensitivity reactions have been observed with TAKHZYRO. In case of a severe hypersensitivity reaction, discontinue TAKHZYRO administration and institute appropriate treatment.

### **Sexual Health**

#### ***Fertility:***

There have been no studies of the effects of TAKHZYRO on human fertility. In a 13-week study conducted in sexually mature cynomolgus monkeys, no lanadelumab-related adverse effects on male or female fertility-related endpoints were observed (see 14 NON-CLINICAL TOXICOLOGY).

## **6.1 Special Populations**

### **6.1.1 Pregnant Women**

TAKHZYRO has not been studied in pregnant women.

In an enhanced pre- and post-natal developmental study conducted in pregnant cynomolgus monkeys, no lanadelumab-related adverse effects on pre- and post-natal development were observed. Lanadelumab was present at measurable levels in infant plasma, indicating that lanadelumab crossed the placental barrier (see 14 NON-CLINICAL TOXICOLOGY).

Animal studies are not always predictive of human response; therefore, it is unknown whether TAKHZYRO can cause fetal harm when administered to a pregnant woman.

### **6.1.2 Breast-feeding**

TAKHZYRO has not been studied in lactating women.

It is unknown if TAKHZYRO is excreted in human milk. Because many drugs are excreted in human milk, precaution should be exercised.

Available pharmacokinetic data from the enhanced pre- and post-natal developmental study

conducted in cynomolgus monkeys demonstrated low excretion of lanadelumab in milk at approximately 0.2% of the maternal plasma level (see 14 NON-CLINICAL TOXICOLOGY).

### 6.1.3 Pediatrics

**Pediatrics (< 12 years):** The safety and efficacy of TAKHZYRO in pediatric patients less than 12 years of age have not been studied.

### 6.1.4 Geriatrics

**Geriatrics (≥ 65 years of age):** The safety and efficacy of TAKHZYRO were evaluated in subjects 65 years of age and older (n=11). Results of the subgroup analysis by age were consistent with overall study results (see 9.3 Pharmacokinetics and 13 CLINICAL TRIALS).

## 7 ADVERSE REACTIONS

### 7.1 Adverse Reaction Overview

Two hundred and fifty seven (257) unique subjects (233 subjects with HAE and 24 healthy subjects) were exposed to at least one dose of lanadelumab in two (2) Phase 1 and two (2) Phase 3 clinical trials.

Of the patients treated with TAKHZYRO in Phase 3 trials (excluding the waiting period in study DX-2930-04), 58.6% experienced at least 1 acute HAE attack (see 13 CLINICAL TRIALS). Most patients (89.1%) treated with TAKHZYRO also experienced adverse events other than HAE attacks (see 7.2 Clinical Trial Adverse Reactions).

In clinical trials, the most commonly observed adverse reactions associated with TAKHZYRO in subjects with HAE were injection site reactions (ISR) including injection site pain, injection site erythema and injection site bruising. Most were of mild intensity and resolved within 1 day after onset. Hypersensitivity reactions have been observed in clinical trials with TAKHZYRO.

In Phase 3 clinical trials with exposure up to 19.6 months, there were 2.7% of subjects that discontinued due to an adverse event other than a HAE attack, 12.3% who had severe adverse events, and 5.0% who had serious adverse events.

### 7.2 Clinical Trial Adverse 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 reaction information from clinical trials is useful for identifying drug-related adverse events and for approximating rates.

Table 2 summarizes adverse reactions observed in the double-blind placebo-controlled clinical trial (DX-2930-03) that included 84 subjects with HAE who received at least one dose of TAKHZYRO (lanadelumab injection). Patients in the trial were 70.4% female, 90.4% white, 8.0% black, with mean age 40.7 years (range 12 to 73 years, n=10 patients <18 years) and mean weight of 80.2 kg. There were 90.4% of patients with HAE Type I and 9.6% with Type II. Patients had a mean HAE attack rate at baseline of 3.7 attacks/month.

**Table 2. Adverse Drug Reactions (ADRs) Observed in the Pivotal Clinical Trial (DX-2930-03) occurring in >1% of patients**

MedDRA System Organ Class	Adverse Drug Reaction	Placebo	TAKHZYRO			
		(N=41)	150 mg q4wks (N=28)	300 mg q4wks (N=29)	300 mg q2wks (N=27)	Total (N=84)
		n (%)	n (%)	n (%)	n (%)	n (%)
General disorders and administrative site conditions	Injection site reactions <sup>a</sup>	14 (34)	16 (57)	13 (45)	15 (56)	44(52)
Immune system disorder	Hypersensitivity <sup>b</sup>	0	0	0	1(4)	1(1)
Investigations	Alanine aminotransferase increased	0	0	1(3)	1(4)	2(2)
	Aspartate aminotransferase increased	0	0	1(3)	1(4)	2(2)
Musculoskeletal and connective tissue disorders	Myalgia	0	1(4)	0	3(11)	4(5)
Nervous system disorders	Dizziness	0	1(4)	3(10)	1(4)	5(6)
Skin and subcutaneous tissue disorder	Rash maculo-papular	0	1(4)	0	1(4)	2(2)
<b>Note:</b>						
N= Number of subjects, n = Number of subjects experiencing the event. Percentages are based on all subjects in the safety population. Percentages are rounded to the nearest integer.						
q4wks : every 4 weeks, q2wks: every 2 weeks						
SOC is presented in MedDRA International Order and MedDRA 20.0 version is used for ADRs.						
<sup>a</sup> Injection site reactions include: pain, erythema, bruising, discomfort, hematoma, hemorrhage, pruritus, swelling, induration, paresthesia, reaction, warmth, edema and rash.						
<sup>b</sup> Hypersensitivity includes: pruritus, discomfort and tingling of tongue.						

In the DX-2930-03 study, there were 1.2% of TAKHZYRO-treated patients and 2.4% of placebo-treated patients that discontinued due to an adverse event other than a HAE attack. There were 9.5% of TAKHZYRO-treated patients who had severe adverse events, and 4.8% who had serious adverse events, compared to 9.8% and 0% in the placebo-treated patients, respectively.

Safety data from all patients treated with lanadelumab in Phase 3 trials (double-blind and open label) for up to 19.6 months (mean 10.35 months) were consistent with data in Table 2, but data on long-term use (>12 months) are limited.

### **Immunogenicity**

As with all therapeutic proteins, there is potential for immunogenicity.

In the double-blind, placebo-controlled clinical trial, 10 (12%) lanadelumab-treated and 2 (5%)



placebo-treated subjects had at least 1 anti-drug antibody (ADA)-positive sample. Two subjects receiving 150 mg q4wks had antibodies classified as neutralizing.

The development of ADA including neutralizing antibodies against TAKHZYRO did not appear to adversely affect the pharmacokinetic (PK), pharmacodynamics (PD), safety or clinical response.

### **Abnormal Laboratory Findings**

One patient in the 300 mg q4wks group discontinued from the trial due to concurrent asymptomatic, transient, severe ADRs of elevated AST (4.1 x ULN) and ALT (3.5 x ULN).

### **7.3 Clinical Trial Adverse Reactions (Pediatrics)**

**Adolescents (12–17 years of age):** The safety of TAKHZYRO in the subgroup of adolescent patients (n=23 in double-blind and open-label Phase 3 trials) was similar to the overall safety profile in Table 2. There were approximately 85% of adolescent patients that experienced non-HAE attack adverse events and about half of patients had treatment-related adverse reactions, mainly ISRs. No adolescent patients discontinued due to adverse events. One patient had a severe serious non-related adverse event.

### **7.4 Post-Market Adverse Reactions**

Not applicable

## **8 DRUG INTERACTIONS**

### **8.1 Drug-Drug Interactions**

Interactions with other drugs have not been established.

### **8.2 Drug-Food Interactions**

Interactions with food have not been established.

### **8.3 Drug-Food Interactions**

Interactions with herbal products have not been established.

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

Prolongation of activated partial thromboplastin time (aPTT) is an indirect effect of plasma kallikrein inhibition and is a laboratory test phenomenon that has not been associated with impaired in vivo hemostasis. In clinical trials with TAKHZYRO, there was an increase in aPTT values as compared to placebo. The majority of values for treated patients remained within the normal range. One patient experienced transient aPTT prolongation  $\geq 1.5$  x ULN while on concomitant heparin therapy. Increases in aPTT were not associated with abnormal bleeding events.

## **9 ACTION AND CLINICAL PHARMACOLOGY**

### **9.1 Mechanism of Action**

Lanadelumab is a fully human monoclonal antibody (IgG1/  $\kappa$ -light chain) that binds plasma kallikrein and inhibits its proteolytic activity. Plasma kallikrein is a protease that cleaves high-

molecular-weight-kininogen (HMWK) to generate cleaved HMWK (cHMWK) and bradykinin, a potent vasodilator that increases vascular permeability resulting in swelling and pain associated with HAE. In patients with HAE due to C1-inhibitor (C1-INH) deficiency or dysfunction, uncontrolled increase in plasma kallikrein activity results in angioedema attacks. Lanadelumab decreases plasma kallikrein activity to control bradykinin generation in patients with HAE.

## 9.2 Pharmacodynamics

Concentration-dependent inhibition of plasma kallikrein, measured as reduction of cHMWK levels, was demonstrated after subcutaneous administration of TAKHZYRO 150 mg q4wks, 300 mg q4wks or 300 mg q2wks in subjects with HAE.

TAKHZYRO did not prolong the QT/QTc interval.

## 9.3 Pharmacokinetics

### Population Pharmacokinetic Analysis

The pharmacokinetics of TAKHZYRO was approximately dose proportional in the dose range of 150 mg q4wks, 300 mg q4wks, and 300 mg q2wks. The anticipated time to reach steady state concentration was approximately 70 days in HAE patients. The pharmacokinetic properties and steady-state exposure of TAKHZYRO in HAE patients, following subcutaneous administration of 300 mg q4wks and 300 mg q2wks (pivotal study), are provided in Table 3.

**Table 3. Mean (SD) Pharmacokinetic Parameters of TAKHZYRO Following Subcutaneous Administration (Pivotal Study)**

Pharmacokinetic Parameters	TAKHZYRO	
	300 mg q4wks N=29	300 mg q2wks N=27
CL/F (L/day)	0.742 (0.239)	0.809 (0.370)
Vc/F (L)	14.9 (4.45)	16.6 (4.79)
AUC <sub>tau,ss</sub> (µg*day/mL)	441(137)	408 (138)
C <sub>max,ss</sub> (µg/mL)	23.3 (7.94)	34.4 (11.2)
C <sub>min,ss</sub> (µg/mL)	8.77 (2.80)	25.4 (9.18)
t <sub>max</sub> (day)	5.17 (1.12)	4.11 (0.377)
t <sub>1/2</sub> (day)	14.2 (1.89)	15.0 (2.48)

CL/F: apparent clearance, Vc/F: apparent volume of distribution, AUC<sub>tau,ss</sub>: area under the curve over the dosing interval at steady-state, C<sub>max,ss</sub>: maximum concentration at steady-state, C<sub>min,ss</sub>: minimum concentration at steady state, T<sub>max</sub>: time to maximum concentration, t<sub>1/2</sub> terminal elimination half-life.

### 9.3.1 Special Populations

Based on population pharmacokinetic analysis, age, gender, and race did not appear to affect the pharmacokinetics of TAKHZYRO after correcting for body weight. Body weight was identified as an important covariate describing the variability of clearance and volume of

distribution; however, dose adjustment according to body weight is not required based on consistent efficacy and safety profiles across the entire study population.

### **Adolescent Population**

Based on population pharmacokinetic analysis, the mean  $AUC_{\tau,ss}$  in adolescents (12-17 years of age) was approximately 37% higher relative to the  $AUC_{\tau,ss}$  in adults following the 300 mg q2wks dose regimen, likely due to lower body weight of the adolescent subjects. Dose adjustment is not required based on consistent efficacy and safety observed between adults and adolescents. (See 7.3 Clinical Trial Adverse Reactions (Pediatrics) and 13 Clinical Trials.)

### **Renal Impairment**

No dedicated studies have been conducted to evaluate the pharmacokinetics of TAKHZYRO in patients with renal impairment. Based on population pharmacokinetic analysis, mild (estimated GFR 60-89 mL/min/1.73m<sup>2</sup>) and moderate (estimated GFR 30-59 mL/min/1.73m<sup>2</sup>) renal impairment did not appear to affect the clearance and volume of distribution of TAKHZYRO.

### **Hepatic Impairment**

No dedicated studies have been conducted to evaluate the pharmacokinetics of TAKHZYRO in patients with hepatic impairment.

#### **9.3.2 Concomitant Medications**

Based on population pharmacokinetic analysis, the use of analgesic, antibacterial, antihistamine, anti-inflammatory and anti-rheumatic medications did not appear to affect the clearance and volume of distribution of TAKHZYRO.

For breakthrough HAE attacks, use of rescue medications such as C1-esterase inhibitor, icatibant or ecallantide did not appear to affect the clearance and volume of distribution of TAKHZYRO.

## **10 STORAGE, STABILITY AND DISPOSAL**

Store TAKHZYRO (lanadelumab injection) under refrigeration (2°C – 8°C). Vials removed from refrigeration should be stored below 25°C and used within 14 days. After storage at room temperature, unopened vials may be returned to the refrigerator. Cumulative storage time at room temperature should not exceed 14 days. Do not freeze. Do not shake. Keep the vial in the original carton to protect TAKHZYRO from light.

## **11 SPECIAL HANDLING INSTRUCTIONS**

Discard unused portions of drug remaining in the vial and syringe.

## PART II: SCIENTIFIC INFORMATION

### 12 PHARMACEUTICAL INFORMATION

#### Drug Substance

Proper name: lanadelumab

Chemical name: lanadelumab (formerly known as DX-2930) is both the USAN and the INN.

Molecular mass: Based on the amino acid sequence, the molecular weight of the non-glycosylated lanadelumab is approximately 146 kDa. The calculated molecular mass of the fully reduced light chain is approximately 23 kDa. The calculated molecular mass of the fully reduced and non-glycosylated heavy chain is approximately 49 kDa.

Structural: Lanadelumab is a non-plasma derived recombinant, fully human monoclonal antibody (IgG1/  $\kappa$ -light chain) produced in Chinese Hamster Ovary (CHO) cells.

Amino acid sequences of the light and heavy chains are shown below. Amino acid sequences (one letter code) were based on the translation of the confirmed DNA sequence in the expression vector. The underlined residue in the heavy chain sequence is a predicted site of N-glycosylation.

#### Light Chain

DIQMTQSPSTLSASVGDRTITCRASQSISSWLAWYQQKPGKAPKLLIYKASTLESGVPSRFSG  
SGSGTEFTLTISLQPDFFATYYCQQYNTYWTFGGGTKVEIKRTVAAPSVFIFPPSDEQLKSGT  
ASVVCLLNFPYPREAKVQWKVDNALQSGNSQESVTEQDSKDSTYSLSSTLTLSKADYEKHKVY  
ACEVTHQGLSPVTKSFNRGEC

#### Heavy Chain

EVQLLESGGGLVQPGGSLRLSCAASGFTFSHYIMMWVRQAPGKGLEWVSGIYSSGGITVYAD  
SVKGRFTISRDNKNTLYLQMNSLRAEDTAVYYCAYRRIGVPRRDEFDIWGQGMVTVSSAST  
KGPSVFPLAPSSKSTSGGTAALGCLVKDYFPEPVTVSWNSGALTSQVHTFPAVLQSSGLYSL  
SVVTVPSSSLGTQTYICNVNHKPSNTKVDKRVKPKSCDKTHTCPPCPAPELGGPSVFLFPPK  
KDTLMISRTPEVTCVVVDVSHEDPEVKFNWYVDGVEVHNAKTKPREEQYNSTYRVVSVLTVLH  
QDWLNGKEYKCKVSNKALPAPIEKTISKAKGQPREPQVYTLPPSREEMTKNQVSLTCLVKGFY  
PSDIAVEWESNGQPENNYKTTTPVLDSDGSFFLYSKLTVDKSRWQQGNVDFSCVMHEALHNH  
YTQKSLSLSPG

#### Product Characteristics

TAKHZYRO (lanadelumab injection) is a colourless to slightly yellow solution, appearing either clear or slightly opalescent. The solution has a pH of approximately 6.0 and an osmolality of approximately 300 mOsm/kg.

## 13 CLINICAL TRIALS

The efficacy and safety of TAKHZYRO in preventing acute attacks in subjects with Type I or Type II hereditary angioedema (HAE) were evaluated in a Phase 3, multi-centre, randomized, double-blind, placebo-controlled study (HELP Study; DX-2930-03). The double-blind study was followed by an open-label, uncontrolled extension study (HELP Study Extension; DX-2930-04).

### 13.1 Trial Design and Results

**Table 4. Summary of Trial Design and Patient Demographics**

Study #	Trial design	Dosage, route of administration and duration	Study subjects (n)	Median age (Range)	Sex
HELP Study (DX-2930-03) Phase 3	Multi-centre Randomized, double-blind, placebo-controlled	300 mg SC q2wks, 300 mg SC q4wks, 150 mg SC q4wks or placebo SC 26 week treatment period	300 mg SC q2wks (27) 300 mg SC q4wks (29) 150 mg SC q4wks (28) or placebo SC (41) N= 125 HAE Type I or II patients	42.4 years (12 – 73)	F = 88 (70.4%) M = 37 (29.6%)
HELP Study Extension (DX-2930-04) Phase 3	Multi-centre, open-label extension	300 mg SC q2wks 132 week treatment period	Rollover <sup>a</sup> :109 Nonrollover <sup>b</sup> : 103 N = 212 HAE Type I or II patients	42.8 years (12 - 76)	F=143 (67.5%) M=69 (32.5%)

<sup>a</sup>Rollover subjects (subjects who participated in DX-2930-03) received their first open-label dose on Day 0 with their second dose administered after their first HAE attack. Subsequent doses for rollover subjects were administered every 2 weeks.

<sup>b</sup>Nonrollover subjects (subjects who did not participate in DX-2930-03) received lanadelumab every 2 weeks.

#### 13.1.1 Pivotal Study

The HELP Study was a multi-centre randomized, double-blind, placebo-controlled, parallel-arm study that included adult (n=115, 92.0%) and adolescent (n=10, 8.0%) subjects with Type I or Type II HAE who experienced at least 1 investigator-confirmed HAE attack per 4 weeks during the run-in period. Subjects who were randomized into 1 of 4 parallel treatment arms, stratified by baseline attack rate, in a 3:2:2:2 ratio (placebo, lanadelumab 150 mg q4wks, lanadelumab 300 mg q4wks, or lanadelumab 300 mg q2wks each by subcutaneous injection) for the 26-week treatment period. Randomization was stratified by baseline attack rate observed during the run-in period into the following groups: 1 to <2 attacks per 4 weeks, 2 to <3 attacks per 4 weeks, and ≥3 attacks per 4 weeks. Patients were required to discontinue other long-term prophylactic HAE treatments prior to the study run-in period. The use of rescue medications for treatment of acute HAE attacks, including C1 esterase inhibitors, was allowed during the study.

During the study, subjects (or caregivers in the circumstance that a subject was <18 years of age) were instructed to notify and report details of an attack to the study site within 72 hours of the onset of an HAE attack. Subjects were asked to provide specific details characterizing the attack, including severity and whether the attack required acute treatment.

The primary efficacy endpoint was the number of investigator-confirmed HAE attacks during the treatment period (Day 0 through Day 182). Key secondary endpoints included the number of investigator-confirmed HAE attacks requiring acute treatment during the treatment period (Day 0 through Day 182), and the number of moderate to severe investigator-confirmed HAE attacks during the treatment period (Day 0 through Day 182).

Overall, 90.4% of patients had Type I HAE. A history of laryngeal angioedema attacks was reported in 64.8% (81/125) of subjects and 56.0% (70/125) were on prior long term prophylaxis (LTP). During the study run-in period, attack rates of  $\geq 3$  attacks/month were observed in 52.0% (65/125) of subjects overall.

All TAKHZYRO treatment arms produced statistically significant reductions in the mean HAE attack rate compared to placebo across the primary (see Table 5) and key secondary endpoints in the Intent-to-Treat population (ITT) (Table 5)

**Table 5. Results of Primary and Key Secondary Efficacy Measures – ITT Population**

Endpoint Statistic	Placebo (N=41)	TAKHZYRO		
		150 mg q4wks (N=28)	300 mg q4wks (N=29)	300 mg q2wks (N=27)
<b>Number of HAE attacks from Day 0 to 182<sup>a</sup></b>				
LS Mean (95% CI) monthly attack rate <sup>b</sup>	1.97 (1.64, 2.36)	0.48 (0.31, 0.73)	0.53 (0.36, 0.77)	0.26 (0.14, 0.46)
% Reduction relative to placebo (95% CI) <sup>c</sup>		75.6 (61.2, 84.6)	73.3 (59.5, 82.4)	86.9 (76.2, 92.8)
p-value <sup>d</sup>		<0.001	<0.001	<0.001
<b>Number of HAE Attacks requiring Acute Treatment from Day 0 to 182</b>				
LS Mean (95% CI) monthly attack rate <sup>b</sup>	1.64 (1.34, 2.00)	0.31 (0.18, 0.53)	0.42 (0.28, 0.65)	0.21 (0.11, 0.40)
% Reduction relative to placebo (95% CI) <sup>c</sup>		80.8 (66.1, 89.2)	74.2 (59.0, 83.7)	87.3 (75.2, 93.5)
p-value <sup>d</sup>		<0.001	<0.001	<0.001
<b>Number of Moderate or Severe HAE Attacks from Day 0 to 182</b>				
LS Mean (95% CI) monthly attack rate <sup>b</sup>	1.22 (0.97, 1.52)	0.36 (0.22, 0.58)	0.32 (0.20, 0.53)	0.20 (0.11, 0.39)
% Reduction relative to placebo (95% CI) <sup>c</sup>		70.5 (49.7, 82.7)	73.3 (54.5, 84.3)	83.4 (67.1, 91.6)
p-value <sup>d</sup>		<0.001	<0.001	<0.001

Note: CI=confidence interval; ITT=intent-to-treat; LS=least squares.

Results are from a Poisson regression model accounting for over dispersion with fixed effects for treatment group (categorical) and normalized baseline attack rate (continuous), and the logarithm of time in days each subject was observed during the treatment period as an offset variable in the model.

<sup>a</sup> Primary efficacy endpoint.

<sup>b</sup> Model-based treatment period HAE attack rate (attacks/4 weeks).

<sup>c</sup> Calculated as one minus the ratio of the model-based treatment period HAE attack rates (lanadelumab/placebo) multiplied by 100.

<sup>d</sup> P-values are adjusted for multiple testing. A general gatekeeping approach with families for each active treatment group to placebo group comparison was utilized to control the global family-wise type I error rate at 0.05. Within a family, hypotheses were tested at  $\alpha/3$  or 0.0167 significance level.

Additional pre-defined exploratory endpoints included the proportion of subjects who achieved a pre-specified reduction from the run-in period in the investigator-confirmed HAE attack rate (i.e., responder analyses). The percentage of responders with a  $\geq 50\%$  reduction in HAE attack rates over the 26 week treatment period was 100% of patients on 300 mg q2wks or q4wks compared to 31.7% of placebo patients. The percentage of responders with a 100% reduction in HAE attack rate (i.e. attack-free) over the 26 week treatment period was 44.4% of patients on 300 mg q2wks and 31.0% of patients on 300 mg q4wks compared to 2.4% of placebo subjects.

The proportion of subjects who achieved an improvement in quality of life as measured by the angioedema quality of life (AE-QoL) questionnaire (minimally important clinical difference (MCID)  $\geq 6$  in the AE-QoL total score) was 80.8% and 63.0% for TAKHZYRO 300 mg q2wks and 300 mg q4wks, and 36.8% for the placebo arm.

### **13.1.2 Long Term Study**

The HELP Study Extension was an open-label uncontrolled study to evaluate the long-term safety and efficacy of TAKHZYRO for prevention of HAE attacks.

A total of 212 adult and adolescent ( $\geq 12$  years) subjects received at least one dose of 300 mg q2wks TAKHZYRO in the HELP Study Extension, including 109 subjects who entered as rollover subjects from the HELP Study. Rollover subjects, regardless of randomization group in the HELP Study, received a single dose of TAKHZYRO 300 mg at study entry and did not receive additional treatment until the occurrence of an HAE attack. After the first HAE attack, all subjects received open-label treatment with TAKHZYRO 300 mg q2wks. The majority of subjects self-administered TAKHZYRO over 10 to 60 seconds (64.4% of 929 injections).

At week 4 post-dose, 80.0% of subjects who had been in the 300 mg q2wks treatment group (n=25) in the HELP Study remained attack-free. These exploratory results should be interpreted with caution as they reflect a select cohort that completed 26-weeks of exposure to lanadelumab (HELP Study) and selectively enrolled in the open-label extension study.

## **14 NON-CLINICAL TOXICOLOGY**

### **14.1 General Toxicology**

In a 6-month repeat-dose toxicity study evaluating once weekly subcutaneous injection in cynomolgus monkeys, lanadelumab was well-tolerated at doses of up to and including 50 mg/kg (highest dose tested) with no organs of toxicity identified. At the no-observed-adverse-effect level (NOAEL) of 50 mg/kg, exposures were approximately 15- and 20-fold greater than human adolescent and adult simulated exposures (AUC) noted at 300 mg q2wks, respectively.

### **14.2 Carcinogenicity**

Animal studies have not been performed to evaluate the carcinogenic potential of lanadelumab.

### **14.3 Genotoxicity**

No studies have been performed to evaluate the genotoxic potential of lanadelumab.

### **14.4 Reproductive and Developmental Toxicology**

The effects of lanadelumab on fertility were evaluated in a 13-week study conducted in sexually mature cynomolgus monkeys. Once weekly subcutaneous administration of lanadelumab had no adverse effects on male or female fertility-related endpoints at doses of 10 and 50 mg/kg (highest dose tested). Lanadelumab did not affect semen sample weight, total sperm count, sperm density, percent sperm motility, sperm morphology, testicular measurements, or menstrual cycle length. There were also no lanadelumab-related adverse effects on reproductive organs, including no adverse histopathological findings. At the NOAEL of 50 mg/kg, exposures were approximately 14- and 19-fold greater than human adolescent and adult simulated exposures (AUC) noted at 300 mg q2wks, respectively.



The developmental effects of lanadelumab were evaluated in an ePPND toxicity study in which pregnant cynomolgus monkeys were subcutaneously administered lanadelumab at doses of 10 or 50 mg/kg (highest dose tested), beginning on gestation day 20 and once weekly thereafter until parturition. There were no lanadelumab-related effects on pregnancy, parturition, embryo-fetal development, survival, growth, or postnatal development of offspring up to 3 months of age. At the NOAEL of 50 mg/kg exposures were approximately 21- and 29-fold greater than human adolescent and adult simulated exposures (AUC) noted at 300 mg q2wks, respectively. Lanadelumab was detected in infant plasma, indicating that lanadelumab crossed the placental barrier; lanadelumab concentrations in infant plasma were approximately 50% of those in maternal plasma on post-natal days 7 and 21 and approximately equivalent to those in maternal plasma on post-natal day 90. Low levels of lanadelumab were also detected in milk at concentrations approximately 0.2% of the maternal plasma level.

**READ THIS FOR SAFE AND EFFECTIVE USE OF YOUR MEDICINE**  
**PATIENT MEDICATION INFORMATION**

(tak-ZYE-roe)  
Pr  
**TAKHZYRO™**  
**lanadelumab injection**

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

**What is TAKHZYRO used for?**

TAKHZYRO is a medicine that is used to prevent attacks of hereditary angioedema (HAE) in adults and adolescents (12 years and older). TAKHZYRO should not be used to treat an acute HAE attack. In the event of an acute attack, seek medical attention.

**How does TAKHZYRO work?**

In HAE, uncontrolled production of a substance called plasma kallikrein occurs. This leads in the release of too much bradykinin in your bloodstream. Too much bradykinin leads to symptoms like swelling and pain. TAKHZYRO is a type of protein that blocks the activity of plasma kallikrein. This helps to limit the production of bradykinin in your bloodstream and can prevent the swelling associated with HAE.

**What are the ingredients in TAKHZYRO?**

Medicinal ingredients: lanadelumab

Non-medicinal ingredients: citric acid, L-histidine, polysorbate 80, sodium chloride, sodium phosphate, water for injection.

**TAKHZYRO comes in the following dosage form:**

Glass single-use vials containing 300 mg/2 mL lanadelumab solution.

**Do not use TAKHZYRO if you:**

- Are allergic to any ingredients in TAKHZYRO (see “What are the ingredients in TAKHZYRO”).
- Are pregnant or planning to become pregnant. It is not known if TAKHZYRO can harm your unborn baby.
- Are breastfeeding or plan to breastfeed. It is not known if TAKHZYRO passes into your milk and if it can harm your baby.

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

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

#### **How to use TAKHZYRO:**

**Do not inject yourself or someone else until you have been trained by your healthcare professional.**

Be sure that you read, understand, and follow the step-by-step instructions for injecting TAKHZYRO. A healthcare professional will show you how to prepare and inject TAKHZYRO properly before you inject yourself for the first time. Contact your healthcare professional if you have any questions.

- You should always follow the specific instructions given by your healthcare professional. The steps listed below are general guidelines for using TAKHZYRO. If you are unsure of the steps, contact your healthcare professional before using TAKHZYRO.
- Only use the syringes, blunt tip vial access needles, and pointed tip administration (injection) needles that your healthcare professional prescribes.
- Only use the syringes, blunt tip vial access needles and pointed tip administration (injection) needles one time. Discard (throw away) any used syringes and needles in the proper disposal container.

#### **Checking the TAKHZYRO vial and your supplies:**

- Collect all supplies listed below to prepare and give your injection.
- Check the expiration date on the box, on the vial label, and on the supplies listed below. Do not use if the expiration date has passed.
- Inspect the supplies for damage. Do not use if they appear damaged.
- Place the supplies on a clean, well-lighted flat work surface.

**TAKHZYRO is colourless to slightly yellow in colour. Do not use the vial if:**

- the medicine is discoloured, or
- the medicine contains particles, or
- the cap covering the stopper is missing.

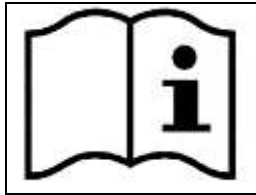
TAKHZYRO is a ready-to-use solution for injection under the skin (subcutaneous injection). It is supplied in a single-use, glass vial at a dosage of 300 mg/2 mL solution.



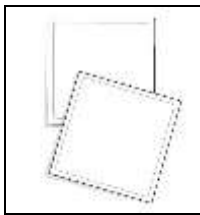
Vial containing TAKHZYRO

**OTHER RECOMMENDED SUPPLIES**

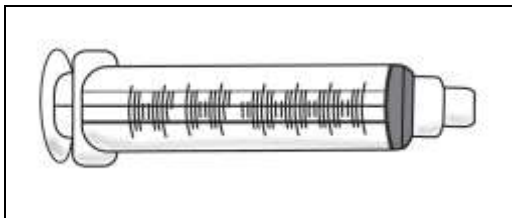
(For illustration purposes, not actual size)



TAKHZYRO Instructions for Use



Alcohol Wipes



One (1) empty 3-mL syringe



One (1) 18G blunt tip vial access needle.

Used to draw drug from the vial into the syringe



One (1) 27G 1/2-inch pointed tip administration (injection) needle

Used for injection under the skin [subcutaneous]



Sharps disposal container

There may be provincial and local laws about the right way to throw away used vials, syringes and needles. Ask your healthcare professional how to throw away used vials, syringes and needles.

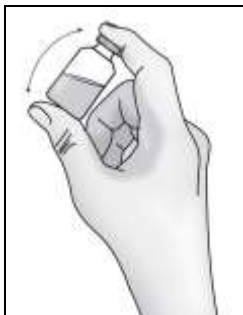
These are the recommended supplies. However, your healthcare professional may choose what is most appropriate for you.

The administration of TAKHZYRO can be summarized in 5 steps:

- 1. Prepare the vial of TAKHZYRO**
- 2. Attach blunt tip vial access needle to syringe**
- 3. Transfer TAKHZYRO into syringe and switch to the pointed tip administration (injection) needle.**
- 4. Select and prepare injection site**
- 5. Inject TAKHZYRO**

### **Step 1: Prepare the vial of TAKHZYRO**

- Take the vial out of the refrigerator 15 minutes before use and allow it to reach room temperature before preparing an injection.
- Clean your work area and wash your hands prior to preparing your dose. Do not touch any surface or body part, especially your face, after washing your hands before injection.
- Gather your TAKHZYRO and supplies and place them on your well-lighted work surface.
- Remove the vial from the packaging.

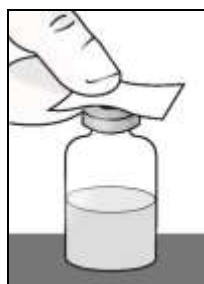


- Gently invert the vial 3 to 5 times to ensure the solution is mixed. Do not shake to avoid foaming.
- Look at the solution in the vial for visible particles or a change in the colour (normally colourless to slightly yellow). Do not use if you see particles or a change in colour.

**Important:** Do not shake the vial.

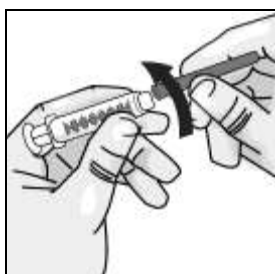


- Remove the plastic cap from the drug vial. Do not remove the drug vial rubber stopper.



- Place the vial on a flat surface. Clean the drug vial rubber stopper with an alcohol wipe and allow it to dry.

## Step 2: Attach blunt tip vial access needle to syringe

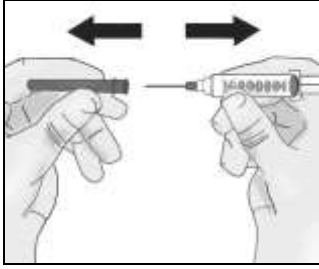


- Screw the 18G blunt tip vial access needle to the 3 mL syringe.

**Important:** Do not remove the needle cap from the needle when attaching to the syringe.

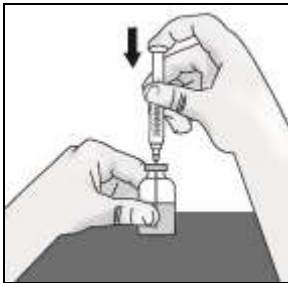


- Pull back the plunger to fill the syringe with air equal to the amount of drug in the vial.

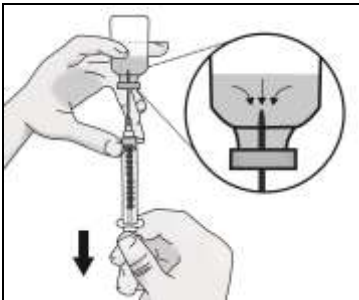


- Pull off the needle cap straight away from the syringe without touching the needle. Do not pull on the plunger.

**Step 3: Transfer TAKHZYRO into syringe and switch to the pointed tip administration (injection) needle**

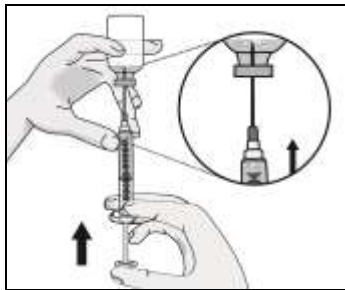


- Insert the needle into the center of the rubber stopper.
- Push the plunger down to inject air into the vial and hold the plunger down.

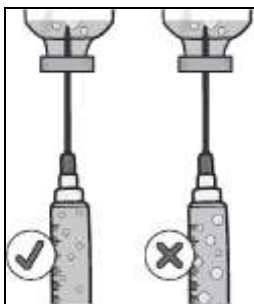


- Slowly turn the vial upside down with needle and syringe attached. Pull back on the plunger to withdraw the full dose in the vial.

**Important:** Be sure to keep the tip of the needle in the liquid to avoid drawing air in as you pull back the plunger.

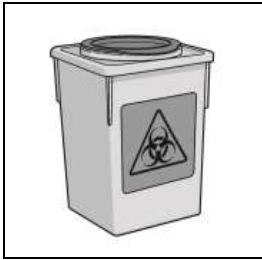


- Remove large air bubbles by gently tapping on the syringe with your fingers until the bubbles rise to the top of the syringe.
- Slowly push the plunger, allowing air to go back into the vial, until the drug reaches the top of the syringe.
- Repeat these steps until large air bubbles are removed.





- Without removing the needle from the vial, unscrew the syringe by holding the needle hub and turning the syringe counter clockwise. Be careful not to press down on the plunger, as the drug will be pushed out.
- Return the syringe to an upright position.



- Discard the vial with the 18G needle still inside into a sharps container.



- Screw the 27G ½-inch administration (injection) needle to the syringe.

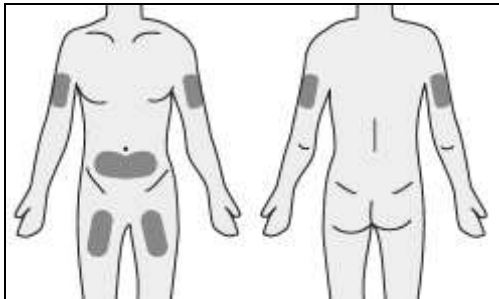
**Important:** Do not remove the needle cap from the needle when attaching to the syringe.

**Do not** use the blunt tip vial access needle to inject TAKHZYRO as this may cause harm such as pain and bleeding



#### Step 4: Select and prepare injection site

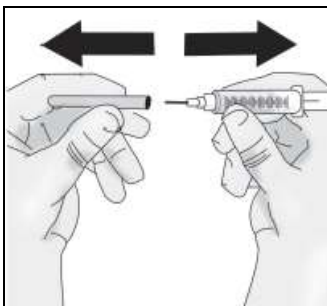
- Choose an injection site on your stomach (abdomen), thigh, or upper arm.
- Clean your injection site with an alcohol wipe and allow it to dry completely.



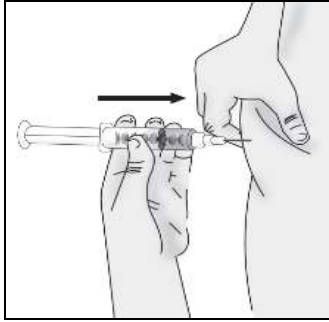
#### Important:

- Rotate injection sites to keep skin healthy.
- The area you choose for injection should be at least 2 inches (5 cm) away from any scars or your belly button (navel). Do not choose an area that is bruised, swollen, or painful.
- The outer area of the upper arm is not recommended for self-administration.
- TAKHZYRO must be administered within 2 hours of preparing your dosing syringe at room temperature. After the dosing syringe is prepared, it can be refrigerated (2°C to 8°C) and must be used within 8 hours of preparation. Take the prepared syringe out of the fridge 15 minutes before use to allow it to reach room temperature before injecting.

#### Step 5: Inject TAKHZYRO

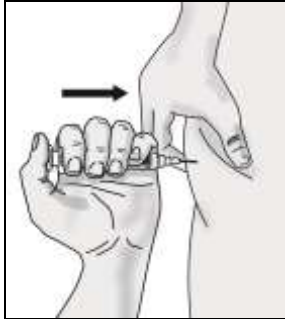


- Pull off the needle cap straight away from the syringe without touching the needle. Do not pull on the plunger. Do not touch the needle tip or allow it to touch any other surface.

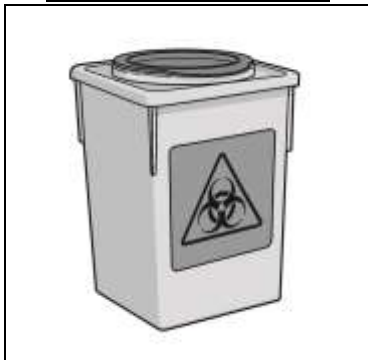


- Gently pinch 1 inch/ 2.5 cm of skin at your cleaned injection site and insert the needle.

**Important:** Be sure to inject into a subcutaneous space that is not too shallow (skin layer) or too deep (muscle).



- Push the plunger slowly until no contents remain in the syringe. Release the skin fold and gently remove the needle. Do not recap the needle.



- Place the 27G ½-inch administration (injection) needle and the syringe in a sharps container.

### Usual dose:

Your healthcare professional will prescribe the dose that you should take. TAKHZYRO is given as an injection under your skin (subcutaneous injection) by you or a caregiver.

### Overdose:

If you think you have taken too much TAKHZYRO, contact your healthcare professional, hospital emergency department or regional poison control centre immediately, even if there are no symptoms.

### Missed Dose:

If you miss a dose of TAKHZYRO you should take your dose as soon as possible, ensuring at least 10 days between doses – do not take your missed dose at the same time as your next scheduled dose. If you are not sure when to take TAKHZYRO after a missed dose, ask your healthcare professional.

## What are possible side effects from using TAKHZYRO?

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

Stop taking TAKHZYRO and tell a healthcare professional immediately if you experience any of the following symptoms of an allergic reaction after taking this medicine. Although they are rare, the symptoms can be severe.

- Sudden wheeziness,
- difficulty in breathing,
- swelling of eyelids, face or lips,
- rash or itching (especially affecting the whole body),
- tight feeling in your chest

The most common side effect seen with TAKHZYRO was injection site reactions including pain, redness, and bruising; followed by: hypersensitivity, myalgia (muscle pain), dizziness and raised skin rash/skin redness.

Do not drive or operate machinery if you feel dizzy after using TAKHZYRO.

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.

### 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/adverse-reaction-reporting.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 in a refrigerator (2° C – 8° C). Do not freeze. Do not shake.
- Vials removed from refrigeration should be stored at room temperature (below 25°C) and used within 14 days. After storage at room temperature, unopened vials may be returned to the refrigerator. The total length of time the medicine is stored at room temperature should not be more than 14 days.
- Keep vial in the original carton to protect the medicine from light.

- Dispose of any unused medicine.
- Keep out of reach and sight of children under 12.

**If you want more information about TAKHZYRO or you want to know more about self-administration:**

- 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 ([health-products.canada.ca/dpd-bdpp](http://health-products.canada.ca/dpd-bdpp)); the manufacturer's website [www.shirecanada.com/pm/en/takhzyro.pdf](http://www.shirecanada.com/pm/en/takhzyro.pdf) or by calling 1-800-268-2772.

This leaflet was prepared by:

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This information is current up to the time of the last revision date shown below, but more current information may be available from the manufacturer.

Last Revised SEP-13-2018

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