

## HIGHLIGHTS OF PRESCRIBING INFORMATION

These highlights do not include all the information needed to use PRALUENT safely and effectively. See [full prescribing information](#) for PRALUENT.

**PRALUENT<sup>®</sup> (alirocumab) injection, for subcutaneous use**  
**Initial U.S. Approval: 2015**

### RECENT MAJOR CHANGES

Dosage and Administration (2.1; 2.2) 04/2017  
Dosage and Administration (2.2) 07/2017

### INDICATIONS AND USAGE

PRALUENT is a PCSK9 (Proprotein Convertase Subtilisin Kexin Type 9) inhibitor antibody indicated as adjunct to diet and maximally tolerated statin therapy for the treatment of adults with heterozygous familial hypercholesterolemia or clinical atherosclerotic cardiovascular disease, who require additional lowering of LDL-cholesterol (LDL-C). (1.1)

#### Limitations of Use

The effect of PRALUENT on cardiovascular morbidity and mortality has not been determined. (1.2)

### DOSAGE AND ADMINISTRATION

The recommended starting dose of PRALUENT is 75 mg once every 2 weeks administered subcutaneously, since the majority of patients achieve sufficient LDL-C reduction with this dosage. An alternative starting dosage for patients who prefer less frequent dosing is 300 mg once every 4 weeks (monthly). (2.1)

If the LDL-C response is inadequate, the dosage may be adjusted to the maximum dosage of 150 mg administered every 2 weeks. (2.1)

### DOSAGE FORMS AND STRENGTHS

- Injection: 75 mg/mL or 150 mg/mL solution in a single-dose pre-filled pen (3)
- Injection: 75 mg/mL or 150 mg/mL solution in a single-dose pre-filled syringe (3)

### CONTRAINDICATIONS

History of a serious hypersensitivity reaction to PRALUENT. (4)

### WARNINGS AND PRECAUTIONS

Allergic Reactions: Hypersensitivity reactions (e.g., pruritus, rash, urticaria), including some serious events (e.g., hypersensitivity vasculitis and hypersensitivity reactions requiring hospitalization), have been reported with PRALUENT treatment. If signs or symptoms of serious allergic reactions occur, discontinue treatment with PRALUENT, treat according to the standard of care, and monitor until signs and symptoms resolve. (5.1)

### ADVERSE REACTIONS

The most commonly occurring adverse reactions ( $\geq 5\%$  of patients treated with PRALUENT and occurring more frequently than with placebo) are nasopharyngitis, injection site reactions, and influenza. (6.1)

To report SUSPECTED ADVERSE REACTIONS, contact Sanofi at 1-800-633-1610 or FDA at 1-800-FDA-1088 or [www.fda.gov/medwatch](http://www.fda.gov/medwatch).

See 17 for PATIENT COUNSELING INFORMATION and FDA-approved patient labeling.

Revised: 7/2017

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of antibodies to PRALUENT with the incidence of antibodies to other products may be misleading.

## 8 USE IN SPECIFIC POPULATIONS

### 8.1 Pregnancy

#### Risk Summary

There are no available data on use of PRALUENT in pregnant women to inform a drug-associated risk. In animal reproduction studies, there were no effects on embryo-fetal development when rats were subcutaneously administered alirocumab during organogenesis at dose exposures up to 12-fold the exposure at the maximum recommended human dose of 150 mg every two weeks. In monkeys, suppression of the humoral immune response was observed in infant monkeys when alirocumab was dosed during organogenesis to parturition at dose exposures 13-fold the exposure at the maximum recommended human dose of 150 mg every two weeks. No additional effects on pregnancy or neonatal/infant development were observed at dose exposures up to 81-fold the maximum recommended human dose of 150 mg every two weeks. Measurable alirocumab serum concentrations were observed in the infant monkeys at birth at comparable levels to maternal serum, indicating that alirocumab, like other IgG antibodies, crosses the placental barrier. FDA's experience with monoclonal antibodies in humans indicates that they are unlikely to cross the placenta in the first trimester; however, they are likely to cross the placenta in increasing amounts in the second and third trimester. Consider the benefits and risks of PRALUENT and possible risks to the fetus before prescribing PRALUENT to pregnant women.

In the U.S. general population, the estimated background risk of major birth defects and miscarriage in clinically recognized pregnancies is 2-4% and 15-20%, respectively.

#### Data

##### *Animal Data*

In Sprague Dawley rats, no effects on embryo-fetal development were observed when alirocumab was dosed at up to 75 mg/kg/dose by the subcutaneous route on gestation days 6 and 12 at exposures 12-fold the maximum recommended human dose of 150 mg every two weeks, based on serum AUC.

In cynomolgus monkeys, suppression of the humoral immune response to keyhole limpet hemocyanin (KLH) antigen was observed in infant monkeys at 4 to 6 months of age when alirocumab was dosed during organogenesis to parturition at 15 mg/kg/week and 75 mg/kg/week by the subcutaneous route, corresponding to 13- and 81-fold the human exposure at the maximum recommended human dose of 150 mg every two weeks, based on serum AUC. The lowest dose tested in the monkey resulted in humoral immune suppression; therefore it is unknown if this effect would be observed at clinical exposure. No study designed to challenge the immune system of infant monkeys was conducted. No additional embryo-fetal, prenatal or postnatal effects were observed in infant monkeys, and no maternal effects were observed, when alirocumab was dosed at up to 75 mg/kg/week by the subcutaneous route, corresponding to

maternal exposure of 81-fold the exposure at the maximum recommended human dose of 150 mg every two weeks, based on serum AUC.

## **8.2 Lactation**

### Risk Summary

There is no information regarding the presence of alirocumab in human milk, the effects on the breastfed infant, or the effects on milk production. The development and health benefits of breastfeeding should be considered along with the mother's clinical need for PRALUENT and any potential adverse effects on the breastfed infant from PRALUENT or from the underlying maternal condition. Human IgG is present in human milk, but published data suggest that breastmilk IgG antibodies do not enter the neonatal and infant circulation in substantial amounts.

## **8.4 Pediatric Use**

Safety and efficacy in pediatric patients have not been established.

## **8.5 Geriatric Use**

In controlled studies, 1158 patients treated with PRALUENT were  $\geq 65$  years of age and 241 patients treated with PRALUENT were  $\geq 75$  years of age. No overall differences in safety or effectiveness were observed between these subjects and younger subjects, and other reported clinical experience has not identified differences in responses between the elderly and younger patients, but greater sensitivity of some older individuals cannot be ruled out.

## **8.6 Renal Impairment**

No dose adjustment is needed for patients with mild or moderately impaired renal function. No data are available in patients with severe renal impairment. [See *Clinical Pharmacology (12.3)*.]

## **8.7 Hepatic Impairment**

No dose adjustment is needed for patients with mild or moderate hepatic impairment. No data are available in patients with severe hepatic impairment. [See *Clinical Pharmacology (12.3)*.]

# **11 DESCRIPTION**

Alirocumab is a human monoclonal antibody (IgG1 isotype) that targets proprotein convertase subtilisin kexin type 9 (PCSK9). Alirocumab is a PCSK9 inhibitor produced by recombinant DNA technology in Chinese Hamster Ovary cell suspension culture. Alirocumab consists of two disulfide-linked human heavy chains, each covalently linked through a disulfide bond to a human kappa light chain. A single N-linked glycosylation site is located in each heavy chain within the CH2 domain of the Fc constant region of the molecule. The variable domains of the heavy and light chains combine to form the PCSK9 binding site within the antibody. Alirocumab has an approximate molecular weight of 146 kDa.

PRALUENT is a sterile, preservative-free, clear, colorless to pale yellow solution for subcutaneous injection. PRALUENT 75 mg/mL or 150 mg/mL solution for subcutaneous injection in a single-dose pre-filled pen or single-dose pre-filled syringe is supplied in a



siliconized 1 mL Type-1 clear glass syringe. The needle shield is not made with natural rubber latex.

Each 75 mg/mL pre-filled pen or pre-filled syringe contains 75 mg alirocumab, histidine (8 mM), polysorbate 20 (0.1 mg), sucrose (100 mg), and Water for Injection USP, to pH 6.0.

Each 150 mg/mL pre-filled pen or pre-filled syringe contains 150 mg alirocumab, histidine (6 mM), polysorbate 20 (0.1 mg), sucrose (100 mg), and Water for Injection USP, to pH 6.0.

## **12 CLINICAL PHARMACOLOGY**

### **12.1 Mechanism of Action**

Alirocumab is a human monoclonal antibody that binds to proprotein convertase subtilisin kexin type 9 (PCSK9). PCSK9 binds to the low-density lipoprotein receptors (LDLR) on the surface of hepatocytes to promote LDLR degradation within the liver. LDLR is the primary receptor that clears circulating LDL, therefore the decrease in LDLR levels by PCSK9 results in higher blood levels of LDL-C. By inhibiting the binding of PCSK9 to LDLR, alirocumab increases the number of LDLRs available to clear LDL, thereby lowering LDL-C levels.

### **12.2 Pharmacodynamics**

Alirocumab reduced free PCSK9 in a concentration-dependent manner. Following a single subcutaneous administration of alirocumab 75 or 150 mg, maximal suppression of free PCSK9 occurred within 4 to 8 hours. Free PCSK9 concentrations returned to baseline when alirocumab concentrations decreased below the limit of quantitation.

### **12.3 Pharmacokinetics**

#### *Absorption*

After subcutaneous (SC) administration of 75 mg to 300 mg alirocumab, median times to maximum serum concentrations ( $t_{max}$ ) were 3-7 days. The pharmacokinetics of alirocumab after single SC administration of 75 mg into the abdomen, upper arm, or thigh were similar. The absolute bioavailability of alirocumab after SC administration was about 85% as determined by population pharmacokinetics analysis. A slightly greater than dose proportional increase was observed, with a 2.1- to 2.7-fold increase in total alirocumab concentrations for a 2-fold increase in dose from 75 mg every 2 weeks to 150 mg every 2 weeks. Monthly dose normalized exposure with 300 mg every 4 weeks treatment was similar to that of 150 mg every 2 weeks. Steady state was reached after 2 to 3 doses with an accumulation ratio up to a maximum of about 2-fold.

#### *Distribution*

Following IV administration, the volume of distribution was about 0.04 to 0.05 L/kg indicating that alirocumab is distributed primarily in the circulatory system.

#### *Metabolism and Elimination*

Specific metabolism studies were not conducted, because alirocumab is a protein. Alirocumab is expected to degrade to small peptides and individual amino acids. In clinical studies where alirocumab was administered in combination with atorvastatin or rosuvastatin, no relevant

changes in statin concentrations were observed in the presence of repeated administration of alirocumab, indicating that cytochrome P450 enzymes (mainly CYP3A4 and CYP2C9) and transporter proteins such as P-gp and OATP were not affected by alirocumab.

Two elimination phases were observed for alirocumab. At low concentrations, the elimination is predominately through saturable binding to target (PCSK9), while at higher concentrations the elimination of alirocumab is largely through a non-saturable proteolytic pathway.

Based on a population pharmacokinetic analysis, the median apparent half-life of alirocumab at steady state was 17 to 20 days in patients receiving alirocumab at subcutaneous doses of 75 mg Q2W or 150 mg Q2W.

#### *Specific Populations*

A population pharmacokinetic analysis was conducted on data from 2799 subjects. Age, body weight, gender, race, and creatinine clearance were found not to significantly influence alirocumab pharmacokinetics. No dose adjustments are recommended for these demographics.

#### Pediatric

PRALUENT has not been studied in pediatric patients [*see Use in Specific Populations (8.4)*].

#### Renal Impairment

Since monoclonal antibodies are not known to be eliminated via renal pathways, renal function is not expected to impact the pharmacokinetics of alirocumab.

No data are available in patients with severe renal impairment.

#### Hepatic Impairment

Following administration of a single 75 mg SC dose, alirocumab pharmacokinetic profiles in subjects with mild and moderate hepatic impairment were similar to those in subjects with normal hepatic function.

No data are available in patients with severe hepatic impairment.

#### *Drug-Drug Interactions*

The median apparent half-life of alirocumab is reduced to 12 days when administered with a statin; however, this difference is not clinically meaningful and does not impact dosing recommendations.

## **13 NONCLINICAL TOXICOLOGY**

### **13.1 Carcinogenesis, Mutagenesis, Impairment of Fertility**

Carcinogenicity studies have not been conducted with alirocumab. The mutagenic potential of alirocumab has not been evaluated; however, monoclonal antibodies are not expected to alter DNA or chromosomes.

There were no adverse effects on surrogate markers of fertility (e.g., estrous cyclicity, testicular volume, ejaculate volume, sperm motility, or total sperm count per ejaculate) in a 6-month chronic toxicology study in sexually-mature monkeys subcutaneously administered at 5, 15, and

75 mg/kg/week at systemic exposures up to 103-fold the 150 mg every two weeks subcutaneous clinical dose based on serum AUC. In addition, there were no adverse alirocumab-related anatomic pathology or histopathology findings in reproductive tissues in rat or monkey toxicology studies at systemic exposures up to 11-fold and 103-fold respectively, in the 6-month studies, compared to clinical systemic exposure following a 150 mg every two weeks dose, based on serum AUC.

### **13.2 Animal Toxicology and/or Pharmacology**

During a 13-week toxicology study of 75 mg/kg once weekly alirocumab in combination with 40 mg/kg once daily atorvastatin in adult monkeys, there were no effects of PRALUENT on the humoral immune response to keyhole limpet hemocyanin (KLH) after one to two months at exposures 100-fold greater than the exposure at the maximum recommended human dose of 150 mg every two weeks, based on AUC.

## **14 CLINICAL STUDIES**

The efficacy of PRALUENT was investigated in five double-blind placebo-controlled trials that enrolled 3499 patients; 36% were patients with heterozygous familial hypercholesterolemia (HeFH) and 54% were non-FH patients who had clinical atherosclerotic cardiovascular disease. Three of the five trials were conducted exclusively in patients with HeFH. All patients were receiving a maximally tolerated dose of a statin, with or without other lipid-modifying therapies. In the trials that enrolled patients with HeFH, the diagnosis of HeFH was made either by genotyping or clinical criteria (“definite FH” using either the Simon Broome or WHO/Dutch Lipid Network criteria). All trials were at least 52 weeks in duration with the primary efficacy endpoint measured at week 24 (mean percent change in LDL-C from baseline).

Three studies used an initial dose of 75 mg every 2 weeks (Q2W) followed by criteria-based up-titration to 150 mg Q2W at week 12 for patients who did not achieve their pre-defined target LDL-C at week 8. The majority of patients (57% to 83%) who were treated for at least 12 weeks did not require up-titration. Two studies used only a 150 mg Q2W dose.

A sixth double-blind, placebo-controlled, 48-week trial enrolled 547 patients on maximally tolerated dose of statin who received PRALUENT 300 mg every 4 weeks (Q4W), 75 mg every 2 weeks (Q2W) or placebo, with criteria-based adjustment to 150 mg Q2W in the PRALUENT arms at week 12. The primary efficacy endpoint was measured at week 24 (mean percent change in LDL-C from baseline).

Study 1 was a multicenter, double-blind, placebo-controlled trial that randomly assigned 1553 patients to PRALUENT 150 mg Q2W and 788 patients to placebo. All patients were taking maximally tolerated doses of statins with or without other lipid-modifying therapy, and required additional LDL-C reduction. The mean age was 61 years (range 18-89), 38% were women, 93% were Caucasian, 3% were Black, and 5% were Hispanic/Latino. Overall, 69% were non-FH patients with clinical atherosclerotic cardiovascular disease and 18% had HeFH. The average LDL-C at baseline was 122 mg/dL.

The proportion of patients who prematurely discontinued study drug prior to the 24-week endpoint was 8% among those treated with PRALUENT and 8% among those treated with placebo.

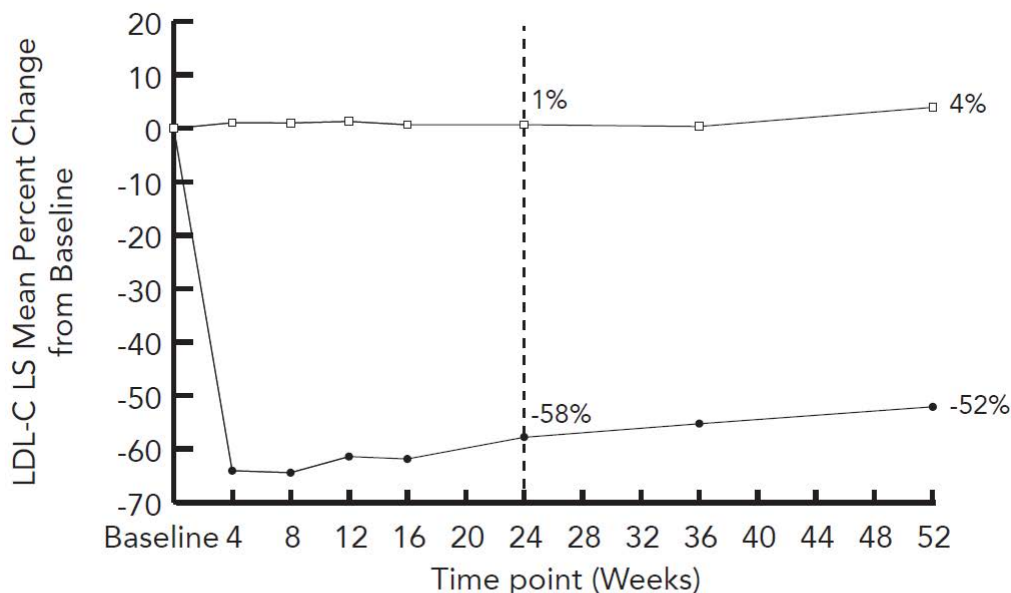
At week 24, the treatment difference between PRALUENT and placebo in mean LDL-C percent change was -58% (95% CI: -61%, -56%; p-value: <0.0001).

For additional results see [Table 2](#) and [Figure 1](#).

**Table 2 Mean Percent Change from Baseline and Difference<sup>a</sup> from Placebo in Lipid Parameters at Week 24 in Study 1<sup>b</sup>**

Treatment Group	LDL-C	Total-C	Non-HDL-C	Apo B
<b>Week 24</b> (Mean Percent Change from Baseline)				
Placebo	1	0	1	1
PRALUENT (150 mg)	-58	-36	-49	-50
Difference from placebo (LS Mean) (95% CI)	-58 (-61, -56)	-36 (-37, -34)	-50 (-52, -47)	-51 (-53, -48)
<sup>a</sup> Difference is PRALUENT minus Placebo <sup>b</sup> A pattern-mixture model approach was used with multiple imputation of missing post-treatment values based on a subject's own baseline value and multiple imputation of missing on-treatment values based on a model including available on-treatment values.				

**Figure 1 Mean Percent Change from Baseline in LDL-C Over 52 Weeks in Patients on Maximally Tolerated Statin Treated with PRALUENT 150 mg Q2W and Placebo Q2W (Study 1)<sup>a</sup>**



Placebo (N) <sup>b</sup>	788	708	676
PRALUENT (N) <sup>b</sup>	1553	1386	1351

—●— PRALUENT      —□— Placebo

<sup>a</sup> The means were estimated based on all randomized patients, with multiple imputation of missing data taking into account treatment adherence.

<sup>b</sup> Number of patients with observed data.

Study 2 was a multicenter, double-blind, placebo-controlled trial that randomly assigned 209 patients to PRALUENT and 107 patients to placebo. Patients were taking maximally tolerated doses of statins with or without other lipid-modifying therapy, and required additional LDL-C reduction.

The mean age was 63 years (range 39-87), 34% were women, 82% were Caucasian, 16% were Black, and 11% were Hispanic/Latino. Overall 84% had clinical atherosclerotic cardiovascular disease. Mean baseline LDL-C was 102 mg/dL.

The proportion of patients who prematurely discontinued study drug prior to the 24-week endpoint was 11% among those treated with PRALUENT and 12% among those treated with placebo.

At week 12, the mean percent change from baseline in LDL-C was -45% with PRALUENT compared to 1% with placebo, and the treatment difference between PRALUENT 75mg Q2W and placebo in mean LDL-C percent change was -46% (95% CI: -53%, -39%).

At week 12, if additional LDL-C lowering was required based on pre-specified LDL-C criteria, PRALUENT was up-titrated to 150 mg Q2W for the remainder of the trial. The dose was up-titrated to 150 mg Q2W in 32 (17%) of 191 patients treated with PRALUENT for at least 12































































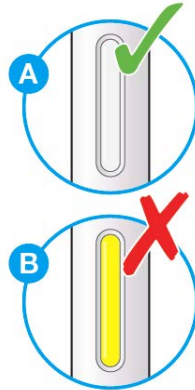






**A2: Look at the window.**

- Check the liquid is clear, colorless to pale yellow and free from particles (see Figure A).
- You may see an air bubble. This is normal.
- **Do not** use if the window appears solid yellow (see Figure B).
- **Do not** use this medicine if the solution is discolored or cloudy, or if it contains visible flakes or particles.



**A3: Let the pen warm up at room temperature for 30 to 40 minutes.**

- This is important for administering the entire dose and helps minimize discomfort.
- Take PRALUENT out of the refrigerator to warm up before using.
- **Do not** heat the pen, let it warm up on its own.
- **Do not** put the pen back in the refrigerator.

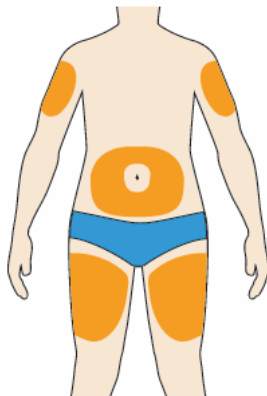


**A4: Prepare the injection site.**

- Wash your hands with soap and water and dry with a towel.
- Clean skin in the injection area with an alcohol wipe.
- You can inject into your (see below picture):
  - thighs
  - stomach (except for the 2 inch area around your navel)
  - upper arms
- You can stand or sit to give yourself an injection.

**Important:**

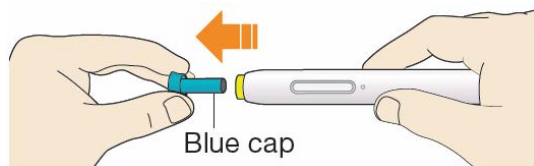
- Change (rotate) your injection site each time you give yourself an injection. If you need to use the same injection site, make sure it is not the same spot on the site you used last time.
- **Do not** inject into areas where the skin is injured, tender, hard, red, or hot. **Do not** inject PRALUENT into areas with visible veins, scars or stretch marks.



### Step B: How to give your injection

**B1: After completing all steps in “Step A: Getting ready for your injection”, pull off the blue cap.**

- **Do not** pull off the cap until you are ready to inject.
- **Do not** put the blue cap back on.



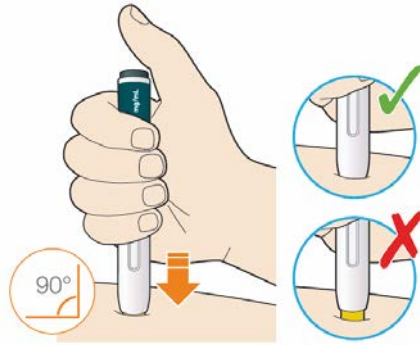
**B2: Hold the PRALUENT pen like this.**

- **Do not** touch the yellow safety cover.
- Make sure you can see the window.



**B3: Press the yellow safety cover on your skin at roughly a 90° angle.**

- Press and firmly hold the pen against your body until the yellow safety cover is no longer visible. The pen will not work if the yellow safety cover is not depressed fully.
- If needed, pinch the skin to make sure the injection site is firm.



**B4: Push and immediately release the gray button with your thumb.**

- You will hear a click. Your injection has now started.
- The window will start to turn yellow.



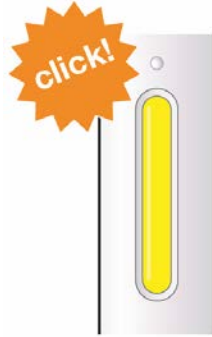
**B5: Keep holding the pen against your skin after releasing the button.**

- The injection may take up to 20 seconds.
- The time required for injection to give the entire dose may be longer than for other injectable medicines.



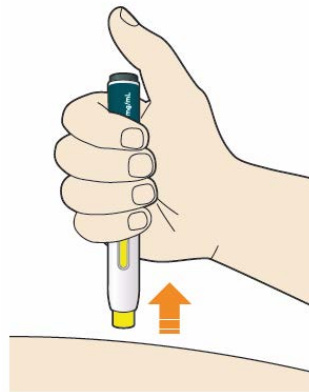
**B6: Check the window has turned yellow, before removing the pen.**

- **Do not** remove the pen until the entire window has turned yellow.
- Your injection is complete when the window has turned completely yellow, you may hear a second click.
- If the window does not turn completely yellow, call 1-844-772-5836 for help. **Do not** give yourself a second dose without speaking to your healthcare provider.



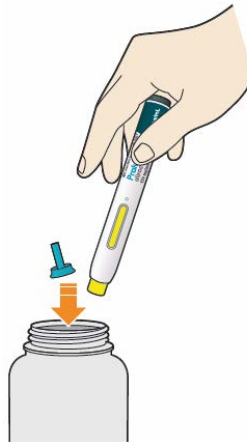
**B7: Pull pen away from your skin.**

- **Do not** rub the skin after the injection.
- If you see any blood, press a cotton ball or gauze on the site until the bleeding stops.



**B8: Discard pen and cap.**

- **Do not** put the blue cap back on.
- Throw away pen and cap in a puncture-resistant container immediately after they have been used.



**Disposing of used pens:**

- Put your used pens in a FDA-cleared sharps disposal container right away after use. **Do not throw away (dispose of) pens and caps in your household trash.**
- If you do not have a FDA-cleared sharps disposal container, you may use a household container that is:

- made of a heavy-duty plastic,
- can be closed with a tight-fitting, puncture-resistant lid, without sharps being able to come out,
- upright and stable during use,
- leak-resistant, and
- properly labeled to warn of hazardous waste inside the container.
- When your sharps disposal container is almost full, you will need to follow your community guidelines for the right way to dispose of your sharps disposal container. There may be state or local laws about how you should throw away used needles and syringes. For more information about safe sharps disposal, and for specific information about sharps disposal in the state that you live in, go to the FDA's website at: <http://www.fda.gov/safesharpsdisposal>.
- Do not dispose of your used sharps disposal container in your household trash unless your community guidelines permit this. Do not recycle your used sharps disposal container.

**Keep PRALUENT and all medicines out of the reach of children.**

This Instructions for Use has been approved by the U.S. Food and Drug Administration.

**REGENERON**

**SANOFI** 

Manufactured by:  
sanofi-aventis U.S. LLC  
Bridgewater, NJ 08807  
A SANOFI COMPANY  
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and Regeneron Pharmaceuticals, Inc. (Tarrytown, NY 10591)

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