

## PRODUCT MONOGRAPH

Pr **STELARA**<sup>®</sup>

ustekinumab Injection

Sterile Solution

45 mg/0.5 mL

90 mg/1.0 mL

Selective Immunomodulating Agent

STELARA<sup>®</sup> (ustekinumab) should be used only by physicians who have sufficient knowledge of plaque psoriasis and/or psoriatic arthritis and who have fully familiarized themselves with the efficacy/safety profile of the drug.

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Date of Preparation:  
December 12, 2008

Date of Revision:  
December 10, 2015

Submission Control No: 180654

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**PART I: HEALTH PROFESSIONAL INFORMATION**

**SUMMARY PRODUCT INFORMATION**

<b>Route of Administration</b>	<b>Dosage Form / Strength</b>	<b>Clinically Relevant Nonmedicinal Ingredients</b>
Subcutaneous Injection	Sterile solution in single-use pre-filled syringe or vial <sup>†</sup> : 45 mg / 0.5 mL, 90 mg/1.0 mL	None <i>For a complete listing see Dosage Forms, Composition and Packaging section.</i>

<sup>†</sup>90 mg/1.0 mL single-use vial is not available in Canada

**DESCRIPTION**

STELARA<sup>®</sup> (ustekinumab) is a fully human IgG1 $\kappa$  monoclonal antibody with an approximate molecular weight of 148,600 daltons. STELARA<sup>®</sup> (ustekinumab) is produced by a recombinant cell line cultured by continuous perfusion and is purified by a series of steps that includes measures to inactivate and remove viruses.

STELARA<sup>®</sup> is supplied as a single-use, sterile solution in a glass syringe with a fixed 27G, half-inch needle and needle cover. The needle cover is manufactured using a dry natural rubber (a derivative of latex) (see **WARNINGS AND PRECAUTIONS, Hypersensitivity Reactions**). The syringe is fitted with a passive safety guard. STELARA<sup>®</sup> does not contain preservatives. STELARA<sup>®</sup> contains 90 mg ustekinumab per mL.

STELARA<sup>®</sup> is also supplied as a sterile solution of ustekinumab for subcutaneous administration in a single-use glass vial<sup>†</sup>. The vial is stoppered with a coated stopper.

## INDICATIONS AND CLINICAL USE

### Plaque Psoriasis

#### **Adults**

STELARA<sup>®</sup> (ustekinumab) is indicated in adult patients for the treatment of chronic moderate to severe plaque psoriasis who are candidates for phototherapy or systemic therapy.

#### **Pediatrics**

STELARA<sup>®</sup> (ustekinumab) is indicated for the treatment of chronic moderate to severe plaque psoriasis in adolescent patients from 12 to 17 years of age, who are inadequately controlled by, or are intolerant to, other systemic therapies or phototherapies.

### Psoriatic Arthritis

STELARA<sup>®</sup> is indicated for the treatment of adult patients with active psoriatic arthritis. STELARA<sup>®</sup> can be used alone or in combination with methotrexate (MTX).

## CONTRAINDICATIONS

- Patients with known hypersensitivity to STELARA<sup>®</sup> or any of its components (see **WARNINGS AND PRECAUTIONS, Hypersensitivity Reactions**).
- Patients with severe infections such as sepsis, tuberculosis and opportunistic infections (see **WARNINGS AND PRECAUTIONS, Infections**).

## WARNINGS AND PRECAUTIONS

### **Infections**

STELARA<sup>®</sup> (ustekinumab) is a selective immunomodulator and may have the potential to increase the risk of infections and reactivate latent infections.

STELARA<sup>®</sup> should not be given to patients with any clinically important active infection. If a patient develops a serious infection they should be closely monitored and STELARA<sup>®</sup> should not be administered until the infection resolves or is adequately treated. Caution should be exercised when considering the use of STELARA<sup>®</sup> in patients with a chronic infection or a history of recurrent infection. Patients should be instructed to seek medical advice if signs or symptoms suggestive of an infection occur.

Prior to initiating treatment with STELARA<sup>®</sup> (ustekinumab), patients should be evaluated for tuberculosis infection. STELARA<sup>®</sup> should not be given to patients with active tuberculosis. Treatment of latent tuberculosis infection should be initiated prior to administering STELARA<sup>®</sup>. Anti-tuberculosis therapy should also be considered prior to initiation of STELARA<sup>®</sup> in patients with a past history of latent or active tuberculosis in whom an adequate course of treatment cannot be confirmed. In clinical studies, patients with latent tuberculosis who were concurrently treated with isoniazid did not develop tuberculosis. Patients receiving STELARA<sup>®</sup> should be monitored closely for signs and symptoms of active tuberculosis during and after treatment.

In clinical studies, serious bacterial, fungal, and viral infections were observed in subjects receiving STELARA<sup>®</sup>. Serious infections requiring hospitalization occurred in the psoriasis and psoriatic arthritis development programs and included diverticulitis, cellulitis, pneumonia, appendicitis, cholecystitis and sepsis (see **ADVERSE REACTIONS**).

### **Carcinogenesis and Mutagenesis**

#### **Malignancies**

STELARA<sup>®</sup> (ustekinumab) is a selective immunomodulator. Immunomodulating agents have the potential to increase the risk of malignancy. Some patients who received ustekinumab in clinical studies developed malignancies (see **ADVERSE REACTIONS**, **Malignancies**).

STELARA<sup>®</sup> (ustekinumab) has not been studied in patients with a history of malignancy. Caution should be exercised when considering the use of STELARA<sup>®</sup> in patients with a history of malignancy or when considering continuing treatment in patients who develop a malignancy.

All patients, in particular those greater than 60 years of age, those with a medical history of prolonged immunosuppressant therapy or those with a history of PUVA treatment, should be monitored for the appearance of skin cancer (see **ADVERSE REACTIONS**).

### **Hepatic/Biliary/Pancreas**

Specific studies have not been conducted in patients with hepatic insufficiency.

### **Hypersensitivity Reactions**

In post-marketing experience, serious allergic reactions, including anaphylaxis and angioedema, have been reported. If an anaphylactic or other serious allergic reaction occurs, institute appropriate therapy and administration of STELARA<sup>®</sup> (ustekinumab) should be discontinued (see **ADVERSE REACTIONS**).

The needle cover on the pre-filled syringe contains dry natural rubber (a derivative of latex), which may cause allergic reactions in individuals sensitive to latex.

### **Immune**

#### **Immunization**

It is recommended that live viral or bacterial vaccines not be given concurrently with STELARA<sup>®</sup> (ustekinumab). No data are available on the secondary transmission of infection by live vaccines in patients receiving STELARA<sup>®</sup>. Caution is advised when administering some live vaccines to household contacts of patients receiving STELARA<sup>®</sup> because of the potential risk for shedding from the household contact and transmission to the patient. Patients receiving STELARA<sup>®</sup> may receive concurrent inactivated or non-live vaccinations (see **DRUG INTERACTIONS**).

Prior to initiating therapy with STELARA<sup>®</sup>, patients should receive all immunizations appropriate for age as recommended by current immunization guidelines. Long term treatment with STELARA<sup>®</sup> does not appear to suppress the immune response to pneumococcal polysaccharide or tetanus vaccines; however, non-live vaccinations received during a course of

STELARA<sup>®</sup> may not elicit an immune response sufficient to prevent disease.(see **ACTION AND CLINICAL PHARMACOLOGY, Immunization**).

### Immunosuppression

In the Phase 3 psoriasis studies, the safety and efficacy of STELARA<sup>®</sup> (ustekinumab) in combination with immunosuppressive agents or phototherapy have not been evaluated. In the Phase 3 psoriatic arthritis studies, concomitant methotrexate did not appear to influence the safety or efficacy of STELARA<sup>®</sup>. Caution should be exercised when considering concomitant use of immunosuppressive agents and STELARA<sup>®</sup>.

### Immunotherapy

STELARA<sup>®</sup> (ustekinumab) has not been evaluated in patients who have undergone allergy immunotherapy. STELARA<sup>®</sup> may affect allergy immunotherapy. Caution should be exercised in patients receiving or who have received allergy immunotherapy particularly for anaphylaxis.

### Neurologic

#### Reversible Posterior Leukoencephalopathy Syndrome

One case of reversible posterior leukoencephalopathy syndrome (RPLS) was observed during the clinical development program which included 5418 STELARA<sup>®</sup>-treated subjects. The subject, who had received 12 doses of STELARA<sup>®</sup> over approximately two and a half years, presented with headache, seizures and confusion in the setting of alcohol abuse. No additional STELARA<sup>®</sup> injections were administered and the subject fully recovered with appropriate treatment.

RPLS is a neurological disorder, which is not caused by demyelination or a known infectious agent. RPLS can present with headache, seizures, confusion and visual disturbances. Conditions with which it has been associated include preeclampsia, acute hypertension, cytotoxic agents, immunosuppressive therapy and alcohol abuse. Fatal outcomes have been reported.

If RPLS is suspected, administer appropriate treatment and discontinue STELARA<sup>®</sup>.

### Renal

Specific studies have not been conducted in patients with renal insufficiency.

### Special Populations

**Pregnant Women:** There is no evidence from animal studies of teratogenicity, birth defects or developmental delays at dose levels up to approximately 45-fold higher than the highest equivalent dose intended to be administered to patients with psoriasis and psoriatic arthritis (see **TOXICOLOGY, Reproductive Toxicology**). However, animal reproductive and developmental studies are not always predictive of human response.

It is not known whether STELARA<sup>®</sup> (ustekinumab) can cause fetal harm when administered to a pregnant woman or whether it can affect reproductive capacity. While it is known that human IgG antibodies, like ustekinumab, cross the placenta, no adequate and well-controlled studies have been conducted to evaluate if ustekinumab can cross the human placenta in pregnant women. In developmental toxicity studies in monkeys, ustekinumab was detected in fetal serum

following repeated dosing of pregnant monkeys during the period of organogenesis. Although ustekinumab crossed the monkey placenta there was no evidence of teratogenicity in these studies. STELARA<sup>®</sup> should be given to a pregnant woman only if the benefit clearly outweighs the risk.

**Nursing Women:** Ustekinumab is excreted in the milk of lactating monkeys administered ustekinumab. It is not known if ustekinumab is absorbed systemically after ingestion. Because many drugs and immunoglobulins are excreted in human milk, and because of the potential for adverse reactions in nursing infants from ustekinumab, a decision should be made whether to discontinue nursing or to discontinue the drug.

**Pediatrics (< 18 years of age):** The efficacy of STELARA<sup>®</sup> (ustekinumab) has been studied in 110 patients 12-17 years of age. The majority of patients (77/110) with pediatric psoriasis studied were 15-17 years of age. Studies of STELARA<sup>®</sup> (ustekinumab) in pediatric patients below 12 years of age have not been conducted.

**Geriatrics (> 65 years of age):** Of the 4135 patients exposed to STELARA<sup>®</sup> in the phase 2 and phase 3 studies in psoriasis and psoriatic arthritis, a total of 252 were 65 years or older (183 patients with psoriasis and 69 patients with psoriatic arthritis). No major age-related differences in clearance or volume of distribution were observed in clinical studies. Although no differences in safety and efficacy were observed between older and younger patients, the number of patients aged 65 and over is not sufficient to determine whether they respond differently from younger patients. Patients over 60 years of age should be closely monitored for skin cancer (see **Carcinogenesis and Mutagenesis**).

## **ADVERSE REACTIONS**

### **Adverse Drug Reaction Overview**

The most common adverse reactions (>5%) in controlled periods of the psoriasis and psoriatic arthritis clinical studies with STELARA<sup>®</sup> (ustekinumab) were nasopharyngitis, headache and upper respiratory tract infection. Most were considered to be mild and did not necessitate drug discontinuation. Serious infections and malignancies were also reported in clinical studies (See **Clinical Trial Adverse Drug Reactions; Infections and Malignancies**).

### **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.*

### **Adults**

The safety data described below reflect exposure to STELARA<sup>®</sup> (ustekinumab) in 7 phase 2 and phase 3 studies in 4135 adult patients with psoriasis and/or psoriatic arthritis, including 3256 exposed for at least 6 months, 1482 exposed for at least 4 years and 838 for at least 5 years.

Table 1.1 summarizes the adverse reactions that occurred at a rate of at least 1% in the STELARA<sup>®</sup> (ustekinumab) group during the placebo-controlled period of the Phase 3 studies (PHOENIX 1, PHOENIX 2, PSUMMIT 1 and PSUMMIT 2).

**Table 1.1 Adverse reactions reported by  $\geq$  1% of patients during the placebo controlled period of PHOENIX 1 and 2 and PSUMMIT 1 and 2\***

	Placebo	STELARA <sup>®</sup> (ustekinumab)	
		45 mg	90 mg
Patients treated	974	972	974
<b>Infections and infestations</b>			
Nasopharyngitis	64 (6.6%)	72 (7.4%)	70 (7.2%)
Upper respiratory tract infection	44 (4.5%)	46 (4.7%)	40 (4.1%)
Dental Infection	2 (0.2%)	9 (0.9%)	10 (1.0%)
<b>Nervous system disorders</b>			
Headache	29 (3.0%)	48 (4.9%)	41 (4.2%)
Dizziness	9 (0.9%)	11 (1.1%)	13 (1.3%)
<b>Respiratory, thoracic and mediastinal disorders</b>			
Oropharyngeal pain	9 (0.9%)	16 (1.6%)	15 (1.5%)
<b>Gastrointestinal disorders</b>			
Diarrhea	15 (1.5%)	22 (2.3%)	18 (1.8%)
Nausea	10 (1.0%)	18 (1.9%)	15 (1.5%)
<b>Skin and subcutaneous tissue disorders</b>			
Pruritus	9 (0.9%)	14 (1.4%)	12 (1.2%)
<b>Muskuloskeletal and connective tissue disorders</b>			
Arthralgia	23 (2.4%)	30 (3.1%)	26 (2.7%)
Back pain	9 (0.9%)	12 (1.2%)	19 (2.0%)
Myalgia	5 (0.5%)	8 (0.8%)	11 (1.1%)
<b>General disorders and administration site conditions</b>			
Fatigue	16 (1.6%)	24 (2.5%)	24 (2.5%)
Injection site erythema	6 (0.6%)	8 (0.8%)	16 (1.6%)

\*Placebo controlled periods are through Week 12 in PHOENIX 1 AND 2 and through Week 16 in PSUMMIT 1 and 2.



Table 1.2 present the rates at which the STELARA<sup>®</sup> ADRs occurred in treatment groups in the ACCEPT trial.

**Table 1.2 Adverse drug reactions reported by ≥1% of patients through Week 12 in ACCEPT**

	ENBREL <sup>®</sup> (etanercept)	STELARA <sup>®</sup> (ustekinumab)	
		45 mg	90 mg
Patients treated	347	209	347
<b>Infections and infestations</b>			
Nasopharyngitis	29 (8.4%)	21 (10.0%)	34 (9.8%)
Upper respiratory tract infection	20 (5.8%)	13 (6.2%)	22 (6.3%)
<b>Nervous system disorders</b>			
Headache	38 (11.0%)	31 (14.8%)	41 (11.8%)
Dizziness	8 (2.3%)	3 (1.4%)	6 (1.7%)
<b>Respiratory, thoracic and mediastinal disorders</b>			
Oropharyngeal pain	14 (4.0%)	5 (2.4%)	14 (4.0%)
<b>Gastrointestinal disorders</b>			
Diarrhea	9 (2.6%)	8 (3.8%)	9 (2.6%)
Nausea	8 (2.3%)	8 (3.8%)	10 (2.9%)
<b>Skin and subcutaneous tissue disorders</b>			
Pruritus	14 (4.0%)	12 (5.7%)	16 (4.6%)
<b>Muskuloskeletal and connective tissue disorders</b>			
Arthralgia	9 (2.6%)	11 (5.3%)	10 (2.9%)
Back pain	7 (2.0%)	14 (6.7%)	15 (4.3%)
Myalgia	7 (2.0%)	3 (1.4%)	7 (2.0%)
<b>General disorders and administration site conditions</b>			
Fatigue	13 (3.7%)	8 (3.8%)	19 (5.5%)
Injection site erythema	51 (14.7%)	2 (1.0%)	2 (0.6%)

## **Infections:**

In placebo-controlled studies of patients with psoriasis and/or psoriatic arthritis, the rates of infection or serious infection were similar between STELARA<sup>®</sup>-treated patients and those treated with placebo. In the placebo-controlled period of clinical studies of psoriasis and psoriatic arthritis patients, the rate of infection was 1.27 per patient-year of follow-up in STELARA<sup>®</sup>-treated patients, and 1.17 per patient-year of follow-up in placebo-treated patients. Serious infections occurred in 0.01 per patient-year of follow-up in STELARA<sup>®</sup>-treated patients (5 serious infections in 616 patient-years of follow-up) and 0.02 per patient-year of follow-up in placebo-treated patients (4 serious infections in 287 patient-years of follow-up) (see **WARNINGS AND PRECAUTIONS**).

In the controlled and non-controlled portions of placebo-controlled psoriasis and psoriatic arthritis clinical studies representing 9848 patient-years of exposure in 4135 patients, the median follow-up was 1.1 years; 3.2 years for psoriasis studies and 1.0 year for psoriatic arthritis studies. Infections were reported in 64.1% (2650/4135) of STELARA<sup>®</sup>-treated patients through up to 5 years. This represents a rate of 0.86 per patient-year of follow-up in ustekinumab-treated patients. Serious infections were reported in 2.3% (95/4135) of patients (1.9% (36/1896) in 45mg and 2.4% (60/2498) in 90mg groups). This represents a rate of 0.01 per patient-year of follow-up in STELARA<sup>®</sup>-treated patients (107 serious infections in 9848 patient-years of follow-up), with 0.01 per patient-year of follow-up in both 45mg and 90mg groups and included diverticulitis, cellulitis, pneumonia, sepsis, appendicitis and cholecystitis.

## **Malignancies:**

In the placebo-controlled period of the psoriasis and psoriatic arthritis clinical studies, the incidence of non-melanoma skin cancer was 0.65 per 100 patient-years of follow-up for STELARA<sup>®</sup>-treated patients (4 patients in 615 patient-years of follow-up) compared with 0.70 per 100 patient-years of follow-up for placebo-treated patients (2 patient in 287 patient-years of follow-up) during the placebo-controlled periods. In a Phase 3 clinical trial (ACCEPT) comparing ustekinumab and etanercept for the treatment of moderate to severe plaque psoriasis, 209 patients received ustekinumab 45mg, 347 patients received ustekinumab 90 mg, and 347 patients received etanercept. Through Week 12, three (0.5%) subjects in the ustekinumab groups had a non-melanoma skin cancer detected in areas of psoriasis that had cleared with treatment. No skin cancers were observed in the etanercept group but due to the short treatment period, the possible pre-existing malignancies and the differences in efficacy (see **CLINICAL TRIALS** section), the clinical relevance has not been established.

The incidence of malignancies excluding non-melanoma skin cancer was 0.16 per 100 patient-years of follow-up for STELARA<sup>®</sup>-treated patients (1 patient in 615 patient-years of follow-up) compared with 0.35 per 100 patient-years of follow-up for placebo-treated patients (1 patient in 287 patient-years of follow-up) during the placebo-controlled periods. In the ACCEPT trial, through Week 12, one subject (0.2%) with a familial history of breast cancer was diagnosed with breast cancer versus no malignancies in the etanercept group.

In the controlled and non-controlled periods of psoriasis and psoriatic arthritis clinical studies representing 9848 patient-years of exposure in 4135 patients, the median follow-up was 1.1 years; 3.2 years for psoriasis studies and 1.0 year for psoriatic arthritis studies. Malignancies excluding nonmelanoma skin cancers were reported in 1.3% (55/4135 patients in 9830 patient-

years of follow-up). This represents an incidence of 0.56 per 100 patients-years of follow-up for STELARA<sup>®</sup>-treated patients. This rate of malignancies reported in STELARA<sup>®</sup>-treated patients was comparable to the rate expected in the general population (standardized incidence ratio = 0.92 [95% confidence interval: 0.69, 1.20]). The most frequently observed malignancies, other than nonmelanoma skin cancer, were prostate (14), melanoma (6), colorectal (5), and breast (5). Nonmelanoma skin cancer was reported in 1.2% (49/4135 in 9815 patient-years of follow-up) among patients treated with STELARA<sup>®</sup>. This represents an incidence of 0.50 per 100 patient-years of follow-up for STELARA<sup>®</sup>-treated patients. The ratio of patients with basal versus squamous cell skin cancers (4:1) is comparable with the ratio expected in the general population.

Among 1569 patients exposed to STELARA<sup>®</sup> for at least 3 years, 0.9% (n= 14) of patients reported NMSC and 1.4% (n=22) of patients reported malignancies excluding NMSC. This represents an incidence of 0.18 and 0.29 per 100 patient-years of follow-up for NMSC and malignancies excluding NMSC, respectively.

### **Hypersensitivity Reactions:**

During the controlled periods of the psoriasis and psoriatic arthritis clinical studies of ustekinumab, rash and urticaria have each been observed in <1% of patients.

### **Immunogenicity:**

2818 patients were tested for antibodies to ustekinumab. In clinical studies, less than 8% of patients treated with ustekinumab developed antibodies to ustekinumab. No apparent association between the development of antibodies to ustekinumab and the development of injection site reactions was observed. 123 of 168 (73%) of psoriasis and psoriatic arthritis patients who were positive for antibodies to ustekinumab had neutralizing antibodies. Patients positive for antibodies to ustekinumab exhibited mean or median serum levels of ustekinumab that were consistently lower than those in patients negative or undetectable for antibodies to ustekinumab and tended to have lower efficacy; however, antibody positivity did not preclude a clinical response.

### **Less Common Clinical Trial Adverse Drug Reactions (<1%)**

The following adverse reactions occurred at rates less than 1% during the controlled period of PHOENIX I and II and PSUMMIT I and II:

**Infections and infestations:** cellulitis, herpes zoster

**Psychiatric disorders:** depression

**General disorders and administration site conditions:** injection site reactions (including pain, swelling, pruritus, induration, hemorrhage, hematoma)

## Abnormal Hematologic and Clinical Chemistry Findings

During the placebo-controlled period of the Phase 2 and Phase 3 psoriasis studies (through week 12), an increase in non-fasting blood glucose levels was observed, as follows: Subjects with any abnormal value: 49 (6.7%) placebo vs. 83 (5.3%) in the combined ustekinumab group; Subjects with > 1 abnormal value: 9 (1.2%) placebo vs 35 (2.2%) in the combined ustekinumab group. The clinical significance of these changes in glucose is unknown. No such increase in fasting blood glucose levels was observed in the same subjects.

### Pediatrics (12 to 17 years of age)

The safety of STELARA<sup>®</sup> has been studied in 110 patients from 12 to 17 years of age for up to 60 weeks.

**Table 1.3 Adverse reactions reported by > 5% of patients during the placebo controlled period of CADMUS**

	Placebo	STELARA <sup>®</sup> (ustekinumab)	
		Half Standard Dosage	Standard Dosage
Patients treated	37	37	36
<b>Infections and infestations</b>			
Upper respiratory tract infection	2 (5.4%)	1 (2.7%)	3 (8.3%)
<b>Nervous system disorders</b>			
Headache	2 (5.4%)	4 (10.8%)	3 (8.3%)
<b>Gastrointestinal disorders</b>			
Diarrhea	0	0	2 (5.6%)

## Post-Market Adverse Drug Reactions

Immune system disorders	Uncommon: Hypersensitivity reactions (including rash, urticaria)  Rare: Serious allergic reactions (including anaphylaxis and angioedema)
Skin and subcutaneous tissue disorders	Uncommon: Pustular psoriasis Rare: Exfoliative dermatitis, erythrodermic psoriasis

\*Post-marketing adverse reaction frequency is derived from the 7 clinical trials if the adverse reaction was observed in those trials. Otherwise, it is estimated to be lower than a certain frequency given the exposure in the 7 clinical trials where the adverse reaction was not observed.

## DRUG INTERACTIONS

### Overview

Specific drug interaction studies have not been conducted with STELARA<sup>®</sup> (ustekinumab).

In population pharmacokinetic analysis, the effect of the most frequently used concomitant medications in patients with psoriasis (including paracetamol/acetaminophen, ibuprofen, acetylsalicylic acid, metformin, atorvastatin, naproxen, levothyroxine, hydrochlorothiazide, and influenza vaccine) on pharmacokinetics of ustekinumab was explored and none of the concomitant medications exerted significant impact. The pharmacokinetics of ustekinumab was not impacted by the prior use of methotrexate, cyclosporine, or other biological therapeutics for the treatment of psoriasis. The pharmacokinetics of ustekinumab was not impacted by concomitant use of MTX, NSAIDs, and oral corticosteroids, or prior exposure to anti-TNF $\alpha$  agents in patients with psoriatic arthritis.

### **Drug-Drug Interactions**

#### **Live Vaccines**

Live vaccines should not be given concurrently with STELARA<sup>®</sup> (ustekinumab) (see **WARNINGS AND PRECAUTIONS**).

#### **Immunosuppressants**

The safety and efficacy of STELARA<sup>®</sup> (ustekinumab) in combination with immunosuppressive agents or phototherapy have not been evaluated (see **WARNINGS AND PRECAUTIONS**).

#### **CYP450 Substrates**

The effects of IL-12 or IL-23 on the regulation of CYP450 enzymes were evaluated in an *in vitro* study using human hepatocytes, which showed that IL-12 and/or IL-23 at levels of 10 ng/mL did not alter human CYP450 enzyme activities (CYP1A2, 2B6, 2C9, 2C19, 2D6, or 3A4). The clinical significance of this is not known, although these results do not suggest the need for dose adjustments in patients who are receiving concomitant CYP450 substrates.

### **Drug-Food Interactions**

Interactions with food have not been established.

### **Drug-Herb Interactions**

Interactions with herbal products have not been established.

### **Drug-Laboratory Interactions**

Interactions with laboratory tests have not been established.

### **Drug-Lifestyle Interactions**

The pharmacokinetics of ustekinumab were not impacted by the use of tobacco or alcohol.

## **DOSAGE AND ADMINISTRATION**

STELARA<sup>®</sup> (ustekinumab) is administered by subcutaneous injection.

## **Dosing Considerations**

STELARA<sup>®</sup> (ustekinumab) is intended for use under the guidance and supervision of a physician. In pediatric patients, it is recommended that STELARA<sup>®</sup> be administered by a health care provider. A patient may self-inject with STELARA<sup>®</sup> (ustekinumab) if a physician determines that it is appropriate after proper training in subcutaneous injection technique and disposal (See **Consumer Information, Proper Use of this Medication**).

Prior to subcutaneous administration, visually inspect the solution for particulate matter and discoloration. The product is colourless to light yellow and may contain a few small translucent or white particles of protein. This appearance is not unusual for proteinaceous solutions. The product should not be used if solution is discolored or cloudy, or if other particulate matter is present. STELARA<sup>®</sup> (ustekinumab) does not contain preservatives; therefore, any unused product remaining in the vial<sup>‡</sup> or syringe should not be used.

The needle cover on the pre-filled syringe contains dry natural rubber (a derivative of latex), which may cause allergic reactions in individuals sensitive to latex.

‡ 90mg/1.0 mL single-use vial is not available in Canada

Patients should be instructed to inject the prescribed amount of STELARA<sup>®</sup> (ustekinumab) according to the directions provided in the CONSUMER INFORMATION Section (see **Product Monograph, Part III: CONSUMER INFORMATION Section**).

## **Recommended Dose and Dosage Adjustment**

### Plaque Psoriasis - Adults

The recommended dose of STELARA<sup>®</sup> (ustekinumab) is 45 mg administered at Weeks 0 and 4, then every 12 weeks thereafter. Alternatively, 90 mg may be used in patients with a body weight greater than 100 kg.

In patients weighing >100 kg, both 45 mg and 90 mg were shown to be efficacious. However, 90 mg was efficacious in a higher percentage of these patients than the 45 mg dose.

For patients who inadequately respond to dosing every 12 weeks, consideration may be given to treating as often as every 8 weeks.

Consideration should be given to discontinuing treatment in patients who have shown no response up to 12 weeks of treatment.

Re-treatment with a dosing regimen of Weeks 0 and 4 followed by 12 week dosing after interruption of therapy has been shown to be safe and effective. (see **CLINICAL TRIALS, Study Results, Efficacy of retreatment**).

### Plaque Psoriasis – Pediatrics (12 to 17 years of age)

The recommended dose of STELARA<sup>®</sup> based on body weight is shown below (Table 1.4). STELARA<sup>®</sup> should be administered at Weeks 0 and 4, then every 12 weeks thereafter.

Consideration should be given to discontinuing treatment in patients who have shown no response up to 12 weeks of treatment.

<b>Weight</b>	<b>Recommended Dose</b>	<b>Dosage Form</b>
<60 kg <sup>a</sup>	0.75 mg/kg*	vial
≥ 60 to ≤ 100 kg	45 mg	Prefilled syringe, vial
> 100 kg <sup>b</sup>	90 mg	Prefilled syringe

\*To calculate the volume of injection (mL) for patients < 60 kg, use the following formula:

*body weight* (kg) x 0.0083 (mL/kg). The calculated volume should be rounded to the nearest 0.01 mL and administered using a 1 mL graduated syringe. A 45 mg vial is available for pediatric patients who need to receive less than the full 45 mg dose.

<sup>a</sup> For patients with body weight < 60kg, use the vial presentation only

<sup>b</sup> There were only 3 patients aged 12 to 17 years, with a body weight > 100 kg in the study

### Psoriatic Arthritis - Adults

The recommended dose of STELARA® (ustekinumab) is 45 mg administered at Weeks 0 and 4, then every 12 weeks thereafter. Alternatively, 90 mg may be used in patients with a body weight greater than 100 kg.

## **OVERDOSAGE**

Single doses up to 4.5 mg/kg intravenously have been administered in psoriasis patients without dose limiting toxicity. In case of overdose, it is recommended that the patient be monitored for any signs or symptoms of adverse reactions or effects and appropriate symptomatic treatment be instituted immediately (see **DETAILED PHARMACOLOGY, TOXICOLOGY**).

For management of a suspected drug overdose, contact your regional Poison Control Centre.
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## **ACTION AND CLINICAL PHARMACOLOGY**

### **Mechanism of Action**

STELARA® (ustekinumab) is a fully human IgG1κ monoclonal antibody, a first-in-class agent that binds with specificity to the shared p40 protein subunit of human cytokines interleukin IL-12 and IL-23. STELARA® inhibits the bioactivity of human IL-12 and IL-23 by preventing p40 from binding to the IL-12Rβ1 receptor protein expressed on the surface of immune cells. STELARA® cannot bind to IL-12 or IL-23 that is already bound to IL-12Rβ1 cell surface receptors. Thus, STELARA® is not likely to contribute to complement or antibody-mediated cytotoxicity of cells expressing IL-12 and/or IL-23 receptors.

IL-12 and IL-23 are heterodimeric cytokines secreted by activated antigen-presenting cells, such as macrophages and dendritic cells. IL-12 stimulates natural killer (NK) cells and drives the differentiation of CD4<sup>+</sup> T cells toward the T helper 1 (Th1) phenotype and stimulates interferon gamma (IFN $\gamma$ ) production. IL-23 induces the T helper 17 (Th17) pathway and promotes secretion of IL-17A, IL-21, and IL-22. Levels of IL-12 and IL-23 are elevated in the skin and blood of patients with psoriasis, and serum IL12/23p40 distinguishes patients with psoriatic arthritis from healthy individuals, implicating IL-12 and IL-23 in the pathophysiology of psoriatic inflammatory diseases. Genetic polymorphisms in IL23A, IL23R, and IL-12B genes confer susceptibility to these disorders. Additionally, IL-12 and IL-23 are highly expressed in lesional psoriatic skin, and IL-12-mediated induction of IFN $\gamma$  correlates with psoriasis disease activity. IL-23 responsive T-cells have been found in the entheses in a mouse model of inflammatory arthritis, where IL-23 drives enthesal inflammation. In addition, there is pre-clinical evidence implicating IL-23 and downstream pathways in bone erosion and destruction through up-regulation of receptor activator of nuclear factor- $\kappa$ B ligand (RANKL), which activates osteoclasts.

By binding the shared p40 subunit of IL-12 and IL-23, STELARA<sup>®</sup> may exert its clinical effects in both psoriasis and psoriatic arthritis through interruption of the Th1 and Th17 cytokine pathways, which are central to the pathology of these diseases.

### **Pharmacodynamics**

Treatment with ustekinumab resulted in significant improvement in histological measures of psoriasis including epidermal hyperplasia and cell proliferation. These results are consistent with the clinical efficacy observed. In patients with psoriasis and/or psoriatic arthritis STELARA<sup>®</sup> (ustekinumab) had no apparent effect on the percentages of circulating immune cell populations including memory and naive T-cell subsets or circulating cytokine levels. Systemic markers of inflammation were measurable in the serum at baseline and 4 markers (MDC, VEGF, MCSF-1 and YKL-40) showed modest differences in concentration post-treatment in STELARA<sup>®</sup>-treated patients as compared to placebo.

Treatment with ustekinumab resulted in a decrease in the gene expression of its molecular targets IL-12 and IL-23 as shown by analyses of mRNA obtained from lesional skin biopsies of psoriatic patients at baseline and up to two weeks post-treatment. In addition, ustekinumab down-regulated the gene expression of inflammatory cytokines and chemokines such as MCP-1, TNF-alpha, IP-10 and IL-8 in lesional skin biopsies. These results are consistent with the significant clinical benefit observed with ustekinumab treatment.

In psoriasis and psoriatic arthritis studies, clinical response (improvement in PASI or ACR measurements, respectively) appeared to be related to serum ustekinumab levels. Patients with psoriasis with higher PASI response had higher median serum concentrations of ustekinumab than those with lower clinical responses. In psoriasis studies, the proportion of patients with psoriasis who achieved PASI 75 response increased with increasing serum levels of ustekinumab. The proportion of patients who achieved PASI 75 response at Week 28 increased with increasing serum ustekinumab trough levels at Week 28. In psoriatic arthritis studies, patients achieving an ACR 20 response had higher median serum concentrations of ustekinumab than ACR 20 non-responders. The proportion of patients who achieved ACR 20 and ACR 50 response increased with increasing serum levels of ustekinumab.



## **Immunization**

During the long term extension of a Phase 3 psoriasis study (PHOENIX 2), patients treated with STELARA<sup>®</sup> for at least 3.5 years mounted similar antibody responses to both pneumococcal polysaccharide and tetanus vaccines as a non-systemically treated psoriasis control group. Similar proportions of patients developed protective levels of anti-pneumococcal and anti-tetanus antibodies and antibody titers were similar among STELARA<sup>®</sup> -treated and control patients. (See **WARNINGS AND PRECAUTIONS, Immune, Immunization**.)

## **Pharmacokinetics**

The median pharmacokinetic parameters of ustekinumab following a single SC administration in adult patients with psoriasis are shown in Table 1.5. The pharmacokinetic parameters of ustekinumab (CL/F, V<sub>z</sub>/F, and t<sub>1/2</sub>) were generally comparable between 45 mg and 90 mg subcutaneous doses.

Dose	45 mg			90 mg		
	N	Median (Range)	Mean (± SD)	N	Median (Range)	Mean (± SD)
C <sub>max</sub> (µg/mL)	22	2.4 (1.0, 5.4)	2.7 (± 1.2)	24	5.3 (1.2, 12.3)	6.1 (± 3.6)
t <sub>max</sub> (day)	22	13.5 (1.9, 58.2)	15.3 (± 13.5)	24	7.0 (2.9, 27.1)	9.9 (± 7.4)
AUC (µg·day/mL)	18	84.9 (31.2, 1261.9)	196.7 (± 298.2)	21	226.9 (57.1, 755.5)	274.9 (± 206.5)
t <sub>1/2</sub> (day)	18	19.8 (5.0, 353.6)	45.6 (± 80.2)	21	21.2 (13.6, 85.8)	26.7 (± 19.3)
CL/F (mL/day/kg)	18	5.3 (0.2, 12.9)	5.8 (± 3.5)	21	4.5 (1.5, 14.9)	5.7 (± 3.6)
V <sub>z</sub> /F (mL/kg)	18	154.2 (32.6, 280.5)	160.5 (± 64.5)	21	160.5 (37.3, 354.1)	178.7 (± 85.2)

Source data: C0379T04 CSR

**Absorption:** The median time to reach the maximum serum concentration (t<sub>max</sub>) was 8.5 days after a single 90 mg subcutaneous administration in healthy subjects (n = 30). The median t<sub>max</sub> values of ustekinumab following a single subcutaneous administration of either 45 mg or 90 mg in patients with psoriasis were comparable to that observed in healthy subjects. The absolute bioavailability (F) of ustekinumab following a single subcutaneous administration was estimated to be 57.2% in patients with psoriasis (n = 17).

**Distribution:** The median apparent volume of distribution during the terminal phase (V<sub>z</sub>/F) following a single subcutaneous administration to patients with psoriasis ranged from 76 to 161 mL/kg (n = 4 to 21).

**Metabolism:** The exact metabolic pathway for ustekinumab is unknown.

**Excretion:** The median apparent clearance (CL/F) following a single subcutaneous administration to patients with psoriasis ranged from 2.7 to 5.3 mL/day/kg. The median half-life (t<sub>1/2</sub>) of ustekinumab was approximately 3 weeks in patients with psoriasis and/or psoriatic

arthritis, ranging from 15 to 32 days across all psoriasis and psoriatic arthritis studies (n = 4 to 55).

**Dose Linearity:** The systemic exposure of ustekinumab ( $C_{max}$  and AUC) increased in a linear manner following a single subcutaneous administration at doses ranging from approximately 24 mg to 240 mg in patients with psoriasis.

**Single Dose vs. Multiple Doses:** Serum concentration-time profiles of ustekinumab were generally predictable after single or multiple subcutaneous dose administrations on the basis of a one-compartment model. Steady-state serum concentrations of ustekinumab were achieved by Week 28 after initial subcutaneous doses at Weeks 0 and 4 followed by doses every 12 weeks. The median steady-state trough concentration ranged from 0.21  $\mu\text{g/mL}$  to 0.26  $\mu\text{g/mL}$  (45 mg; n = 242 to 390) and from 0.47  $\mu\text{g/mL}$  to 0.49  $\mu\text{g/mL}$  (90 mg; n = 236 to 386) in patients with psoriasis. There was no apparent accumulation in serum ustekinumab concentration over time when given subcutaneously every 12 weeks.

**Impact of Weight on Pharmacokinetics:**

Serum ustekinumab concentrations were affected by weight in patients with psoriasis and/or psoriatic arthritis. When given the same dose, patients of higher weight (> 100 kg) had lower median serum ustekinumab concentrations compared with those in patients of lower weight ( $\leq$  100 kg). However, across doses, the median trough serum concentrations of ustekinumab in patients with higher weight (> 100 kg) in the 90 mg group were comparable to those in patients with lower weight ( $\leq$  100 kg) in the 45 mg group.

Of the demographic factors (e.g., gender, race, age, body size), baseline patient physical or biochemical characteristics, medical or medication history, or concomitant medications evaluated in a population pharmacokinetic analysis, only body weight, diabetes comorbidity, and positive immune response to ustekinumab were found to be important covariates affecting the systemic exposure to ustekinumab in patients with moderate to severe psoriasis. Body weight and positive immune response to ustekinumab were also found to be important covariates affecting the systemic exposure to ustekinumab in subjects with psoriatic arthritis. Clinical relevance of the effects of these important covariates, however, needs to be evaluated concurrently with clinical efficacy and safety data.

**Special Populations and Conditions**

**Pediatrics (< 18 years of age):** Studies of STELARA<sup>®</sup> (ustekinumab) in pediatric patients below 12 years of age have not been conducted.

**Geriatrics (> 65 years of age):** No specific studies have been conducted in elderly patients.

**Gender, Race and Genetic Polymorphism:** The apparent clearance of ustekinumab was not impacted by sex, age, or race.

**Hepatic Insufficiency:** No pharmacokinetic data are available in patients with impaired hepatic function.

**Renal Insufficiency:** No pharmacokinetic data are available in patients with renal insufficiency.

## STORAGE AND STABILITY

STELARA<sup>®</sup> (ustekinumab) must be refrigerated at 2 to 8°C and protected from light. Keep the product in the original carton to protect from light until the time of use. Do not freeze. Do not shake.

## SPECIAL HANDLING INSTRUCTIONS

Following administration of STELARA<sup>®</sup> (ustekinumab), discard any unused portion. The syringe should be disposed of in a puncture-resistant container for syringes and needles. Patients or caregivers should be instructed in the technique as well as proper syringe and needle disposal, and not to reuse these items.

## DOSAGE FORMS, COMPOSITION AND PACKAGING

STELARA<sup>®</sup> (ustekinumab) is supplied as a single-use, sterile solution in a Type 1 glass syringe with a fixed 27G, half-inch needle and needle cover. The needle cover is manufactured using a dry natural rubber (a derivative of latex) (see **WARNINGS AND PRECAUTIONS, Hypersensitivity Reactions**). The syringe is fitted with a passive safety guard. STELARA<sup>®</sup> (ustekinumab) is also supplied as a sterile solution in a single-use (Type 1) glass vial with a coated stopper<sup>‡</sup>.

Each mL of STELARA<sup>®</sup> (ustekinumab) contains 90 mg of ustekinumab.

STELARA<sup>®</sup> (ustekinumab) contains the following inactive ingredients:

sucrose, L-histidine, L-histidine monohydrochloride monohydrate, polysorbate 80, and water for injection.

STELARA<sup>®</sup> (ustekinumab) does not contain preservatives.

There are two strengths of STELARA<sup>®</sup> (ustekinumab) available: 45 mg of ustekinumab in 0.5 mL and 90 mg of ustekinumab in 1.0 mL.

STELARA<sup>®</sup> is available as a solution for subcutaneous administration in the following packaging presentations:

- 1 single-use pre-filled syringe
- 1 single-use vial<sup>‡</sup>

<sup>‡</sup> 90 mg/1.0 mL single-use vial is not available in Canada

## PART II: SCIENTIFIC INFORMATION

### PHARMACEUTICAL INFORMATION

#### Drug Substance

Proper name:	STELARA <sup>®</sup>
Chemical name:	Ustekinumab
Molecular formula and molecular mass:	Ustekinumab is a fully human IgG1 $\kappa$ mAb, with an approximate molecular weight of 148,600 daltons.
Physicochemical properties:	STELARA <sup>®</sup> solution is clear to slightly opalescent, colourless to light yellow with a pH of approximately 6.0.

#### Product Characteristics

STELARA<sup>®</sup> (ustekinumab) is supplied as a single-use, sterile solution in a Type 1 glass syringe with a fixed 27G, half-inch needle and needle cover. The needle cover is manufactured using a dry natural rubber (a derivative of latex) (see **WARNINGS AND PRECAUTIONS, Hypersensitivity Reactions**). The syringe is fitted with a passive safety guard. STELARA<sup>®</sup> (ustekinumab) is also supplied as a sterile solution in a single-use (Type 1) glass vial for SC administration<sup>‡</sup>.

STELARA<sup>®</sup> (ustekinumab) is supplied as 2 dosage presentations at 45 mg in 0.5 mL volume or at 90 mg in 1 mL volume. Each 1 mL of STELARA<sup>®</sup> (ustekinumab) liquid contains 90 mg ustekinumab. No preservatives are present.

<sup>‡</sup> 90 mg/1.0 mL single-use vial is not available in Canada

#### Viral Inactivation

STELARA<sup>®</sup> (ustekinumab) is produced by a recombinant cell line cultured by continuous perfusion and is purified by a series of steps that includes measures to inactivate and remove viruses.

### CLINICAL TRIALS

#### Plaque Psoriasis - Adults

The safety and efficacy of ustekinumab was assessed in two multicentre, randomized, double-blind, placebo-controlled studies (PHOENIX 1 and PHOENIX 2) in patients 18 years of age and older with chronic (>6 months) plaque psoriasis who had a minimum body surface area (BSA) involvement of 10%, and Psoriasis Area and Severity Index (PASI) score  $\geq 12$  and who were candidates for phototherapy or systemic therapy. Patients with guttate, erythrodermic, or pustular psoriasis were excluded from the studies. No concomitant anti-psoriatic therapies were allowed during the study with the exception of low-potency topical corticosteroids on the face

and groin after Week 12. A total of 1996 patients were enrolled in the two studies. The safety and efficacy of ustekinumab beyond 5 years have not been established.

In addition, a multicenter, randomized, active-controlled study (ACCEPT) compared the safety and efficacy of ustekinumab and etanercept in patients 18 years of age and older with chronic (>6 months) plaque psoriasis who had a minimum BSA involvement of 10%, PASI score  $\geq 12$ , Physician Global Assessment (PGA) score  $\geq 3$ , who were candidates for phototherapy or systemic therapy, and who had had an inadequate response to, intolerance to, or contraindication to cyclosporine, methotrexate, or PUVA therapy. A total of 903 patients were enrolled in the study.

### Study demographics and trial design

Baseline disease characteristics across PHOENIX 1 and 2 were similar (Table 2.1 and Table 2.2). In both studies, patients in all treatment groups had a median baseline PASI score ranging from 17 to 18. Approximately two-thirds of all patients had received prior phototherapy, 69% had received either prior conventional systemic or biologic therapy for the treatment of psoriasis, with 56% receiving prior conventional systemic therapy and 43% receiving prior biologic therapy. A total of 28% of study patients had a history of psoriatic arthritis. Similar disease characteristics were also seen in the ACCEPT trial (Table 2.1 and Table 2.2).

**Table 2.1: Summary of patient demographics for PHOENIX 1, PHOENIX 2 and ACCEPT**

Study #	Trial design	Dosage, route of administration and duration	Study subjects (n=number)	Mean age (Range)	Gender
C0743T08 (PHOENIX 1)	Double-Blind Placebo-Controlled	Fixed doses: Placebo (N = 255) Placebo → 45 mg SC regimen <sup>a</sup> (N = 123) Placebo → 90 mg SC regimen <sup>a</sup> (N = 120) 45 mg SC Weeks 0, 4 then q12w (N = 255) 90 mg SC Weeks 0, 4 then q12w (N = 256)	N=766	45.3 (19,76)	M=531 F=235
C0743T09 (PHOENIX 2)	Double-Blind Placebo-Controlled	Fixed doses: Placebo (N = 410)-Placebo → 45 mg SC regimen <sup>a</sup> (N = 197) Placebo → 90 mg SC regimen <sup>a</sup> (N = 195) 45 mg SC Weeks 0, 4 then q12w (N = 409) 90 mg SC Weeks 0, 4 then q12w (N = 411)	N=1230	46.2 (18, 86)	M=840 F=390
C0743T12 (ACCEPT)	Assessor-Blind Active-Comparator Controlled	Fixed doses: Etanercept 50 mg (N=347) twice weekly through Week 12 Ustekinumab 45 mg (N=209) at Week 0 and 4 Ustekinumab 90 mg (N=347) at Week 0 and 4	N= 903	45.0 (18, 81)	M = 613 F = 290

<sup>a</sup> The placebo groups crossed over to receive ustekinumab (45 mg or 90 mg) at Weeks 12 and 16 then q12w

**Table 2.2: Baseline Disease Characteristics in PHOENIX 1, PHOENIX 2 and ACCEPT**

	PHOENIX 1		PHOENIX 2		ACCEPT	
	Placebo	Ustekinumab	Placebo	Ustekinumab	Etanercept	Ustekinumab
Patients randomized at Week 0	N=255	N=511	N=410	N=820	N=347	N=556
Median BSA	22.0	21.0	20.0	21.0	19.0	20.0
BSA $\geq$ 20%	145 (57%)	276 (54%)	217 (53%)	445 (54%)	169 (49%)	289 (52%)
Median PASI	17.80	17.4	16.90	17.60	16.8	17.1
PASI $\geq$ 20	91 (36%)	169 (33%)	133 (32%)	300 (37%)	102 (29%)	205 (37%)
PGA of marked or severe	112 (44%)	223 (44%)	160 (39%)	328 (40%)	148 (43%)	242 (44%)
History of psoriatic arthritis	90 (35%)	168 (33%)	105 (26%)	200 (24%)	95 (27%)	157 (28%)
Prior phototherapy	150 (59%)	342 (67%)	276 (67%)	553 (67%)	224 (65%)	368 (66%)
Prior conventional systemic therapy excluding biologics <sup>a</sup>	142 (56%)	282 (55%)	241 (59%)	447 (55%)	199(57%)	311 (56%)
Prior conventional systemic or biologic therapy <sup>a</sup>	189 (74%)	364 (71%)	287 (70%)	536 (65%)	218(63%)	337 (61%)
Failed to respond to, had contraindication for, or intolerant to $\geq$ 1 conventional therapy <sup>a</sup>	139 (55%)	270 (53%)	254 (62%)	490 (60%)	347 (100%)	555 (100%)
Failed to respond to, had contraindication for, or intolerant to $\geq$ 3 conventional therapies <sup>a</sup>	30 (12%)	54 (11%)	66 (16%)	134 (16%)	52 (15%)	78 (14%)

<sup>a</sup> In PHOENIX 1 and 2, conventional systemic agents include acitretin, PUVA, methotrexate, and cyclosporine. In ACCEPT, conventional systemic agents included PUVA, methotrexate, and cyclosporine. All patients were required to be etanercept naïve at baseline in ACCEPT, but in PHOENIX 1 and 2 patients may have previously received etanercept.

PHOENIX 1 evaluated the safety and efficacy of ustekinumab versus placebo in 766 patients with plaque psoriasis. Patients were randomized in equal proportion to placebo, 45 mg or 90 mg of ustekinumab. Patients randomized to ustekinumab received 45 mg or 90 mg doses at Weeks 0 and 4 followed by the same dose every 12 weeks. Patients randomized to receive placebo at Weeks 0 and 4 crossed over to receive ustekinumab (either 45 mg or 90 mg) at Weeks 12 and 16 followed by the same dose every 12 weeks. To evaluate the efficacy of every 12-week dosing, patients who were PASI 75 responders at both Weeks 28 and 40 were re-randomized to either continue dosing of ustekinumab every 12 weeks or to placebo (i.e., withdrawal of therapy). Patients withdrawn from ustekinumab at Week 40 reinitiated ustekinumab at their original dosing regimen when they experienced at least a 50% loss of their PASI improvement obtained at Week 40. Patients were followed for at least 76 weeks.

PHOENIX 2 evaluated the safety and efficacy of ustekinumab versus placebo in 1230 patients with plaque psoriasis. This study design was identical to PHOENIX 1 through Week 28.

#### Dose Adjustment (every 8 weeks)

At Week 28, PHOENIX 1 patients who were nonresponders (<PASI 50 response) discontinued treatment and patients who were partial responders ( $\geq$  PASI 50 response and <PASI 75 response) were adjusted to every-8-week dosing. PASI 75 responders at Week 28 who became partial responders or nonresponders at Week 40 were adjusted to every-8-week dosing.

In PHOENIX 2, patients who were partial responders at Week 28 were re-randomized to either continue every 12 weeks dosing of ustekinumab or to switch to every 8 weeks dosing.

All patients were followed for up to 76 weeks in PHOENIX 1 and up to 52 weeks in PHOENIX 2 following first administration of study treatment.

In both studies, the primary endpoint was the proportion of patients who achieved a reduction in score of at least 75% from baseline at Week 12 by the PASI (PASI 75). Patients achieving  $\geq$  90% improvement in PASI from baseline (PASI 90) were considered PASI 90 responders and patients with  $\geq$  50% improvement in PASI from baseline (PASI 50) were considered PASI 50 responders. Another key efficacy assessment was the Physician's Global Assessment (PGA), a 6-category scale ranging from 0 (cleared) to 5 (severe) that indicates the physician's overall assessment of psoriasis focusing on plaque thickness/induration, erythema, and scaling.

The Dermatology Life Quality Index (DLQI), a dermatology-specific quality of life instrument designed to assess the impact of the disease on a patient's quality of life, was assessed in both PHOENIX 1 and PHOENIX 2. Other efficacy assessments included the Nail Psoriasis Severity Index (NAPSI), a physician-assessed score that measures the severity of nail involvement (PHOENIX 1); the Itch Visual Analog Scale (VAS), used to assess the severity of itch at the time of the assessment (PHOENIX 1); the Hospital Anxiety and Depression Scale (HADS), a self-rating tool developed to evaluate psychological measures in patients with physical ailments (PHOENIX 2); and the Work Limitations Questionnaire (WLQ), a 25-item, self-administered questionnaire that was used to measure the impact of chronic health conditions on job performance and work productivity among employed populations (PHOENIX 2).

The ACCEPT trial compared the efficacy of ustekinumab to etanercept and evaluated the safety of ustekinumab and etanercept in moderate to severe psoriasis patients. The active-controlled portion of the study was from Week 0 to Week 12, during which the efficacy and safety of etanercept and 2 dose levels of ustekinumab were evaluated. This trial was powered to test the superiority of each dose level to etanercept and the primary endpoint was the proportion of patients who achieved a PASI 75 at week 12.

### **Study results**

The results of PHOENIX 1 and PHOENIX 2 for key psoriasis clinical outcomes are presented in Table 2.3.

#### *Efficacy at the Primary Endpoint, PHOENIX 1 and PHOENIX 2*

The onset of action with ustekinumab was rapid and improvement was seen within 2 weeks of the first dose. In both the PHOENIX 1 and PHOENIX 2 studies, a significantly greater proportion of patients randomized to treatment with ustekinumab were PASI 75 responders compared with placebo at Week 12 (Table 2.3). In the PHOENIX 1 study, 67% and 66% of patients receiving ustekinumab 45 mg and 90 mg, respectively, achieved a PASI 75 response at Week 12 compared with 3% of patients receiving placebo. In the PHOENIX 2 study, 67% and 76% of patients receiving ustekinumab 45 mg and 90 mg, respectively, achieved a PASI 75 response at Week 12 compared with 4% of patients receiving placebo.

All 3 components of the PASI (plaque thickness/induration, erythema, and scaling) contributed comparably to the improvement in PASI.

The efficacy of ustekinumab was significantly superior ( $p < 0.001$ ) to placebo across all subgroups defined by baseline demographics, clinical disease characteristics (including patients with a history of psoriatic arthritis) and prior medication usage. While pharmacokinetic modelling suggested a trend towards higher CL/F in patients with diabetes, a consistent effect on efficacy was not observed.

**Table 2.3: Clinical Outcomes - PHOENIX 1 and PHOENIX 2**

	PHOENIX 1			PHOENIX 2		
	Placebo	Ustekinumab		Placebo	Ustekinumab	
		45 mg	90 mg		45 mg	90 mg
<b>Week 12</b>						
Patients randomized	255	255	256	410	409	411
<b>PASI response</b>						
PASI 50 response <sup>a</sup>	26 (10%)	213 (84%)	220 (86%)	41 (10%)	342 (84%)	367 (89%)
PASI 75 response <sup>a</sup>	8 (3%)	171 (67%)	170 (66%)	15 (4%)	273 (67%)	311 (76%)
PASI 90 response <sup>a</sup>	5 (2%)	106 (42%)	94 (37%)	3 (1%)	173 (42%)	209 (51%)
PASI 100 response <sup>a</sup>	0 (0%)	33 (13%)	28 (11%)	0 (0%)	74 (18%)	75 (18%)
<b>PGA of Cleared or Minimal<sup>a</sup></b>						
	10 (4%)	151 (59%)	156 (61%)	18 (4%)	277 (68%)	300 (73%)
<b>Week 28</b>						
Patients evaluated	--	250	243	--	397	400
<b>PASI response</b>						
PASI 50 response	--	228 (91%)	234 (96%)	--	369 (93%)	380 (95%)
PASI 75 response	--	178 (71%)	191 (79%)	--	276 (70%)	314 (79%)
PASI 90 response	--	123 (49%)	135 (56%)	--	178 (45%)	217 (54%)
PASI 100 response	--	52 (21%)	71(29 %)	--	74(19%)	118 (30%)
<b>PGA of Cleared or Minimal</b>						
	--	146 (58%)	160 (66%)	--	241(61%)	279 (70%)

<sup>a</sup>  $p < 0.001$  for 45 mg or 90 mg comparison with placebo.

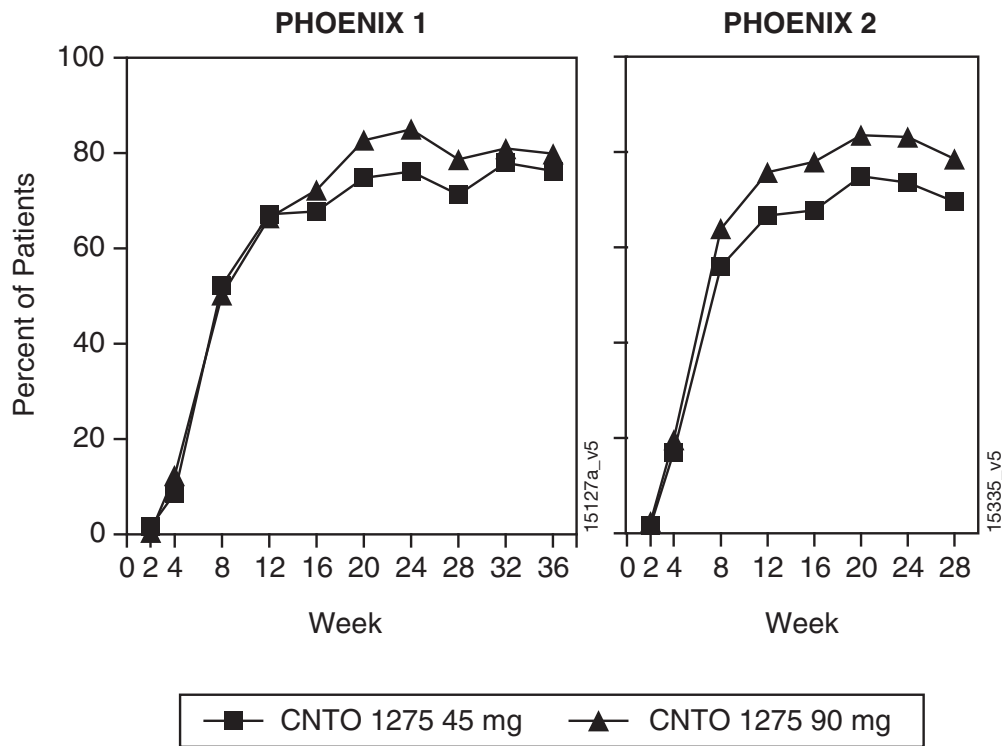


### Other efficacy measures at Week 12

In both PHOENIX 1 and PHOENIX 2, compared with placebo, significantly greater proportions of patients randomized to 45 mg or 90 mg ustekinumab achieved a cleared or minimal PGA score, and significantly greater proportions of patients randomized to 45 mg or 90 mg ustekinumab were PASI 50, PASI 90 and PASI 100 responders at Week 12 (Table 2.3). In the PHOENIX 1 study, 60% and 62% of the patients treated with 45 mg and 90 mg ustekinumab, respectively, achieved PGA scores of cleared or minimal compared with 4% of placebo-treated patients. In PHOENIX 2, 68% and 73% of patients receiving 45 mg or 90 mg ustekinumab, respectively, had cleared or minimal PGA scores compared with 5% of the placebo patients. In PHOENIX 1, PASI 90 was achieved by 42% and 37% of the patients treated with 45 mg and 90 mg ustekinumab, respectively, compared with 2% of placebo-treated patients. In addition, a significantly higher proportion of subjects treated with either 45 mg (13%) or 90 mg (11%) achieved a PASI of 0 (i.e., PASI 100 response) compared with the placebo group (0.0%;  $p < 0.001$ ). In PHOENIX 2, the percentage of patients achieving PASI 100 and PASI 90 was 18% and 42%, respectively, in the 45 mg ustekinumab group, and 18% and 51%, respectively, in the 90 mg ustekinumab group versus 1% in the placebo group. The percentage of patients achieving PASI 50 in PHOENIX 1 was 84% and 86% in the 45 mg and 90 mg ustekinumab groups, respectively, compared with 10% in the placebo group. Similarly, 84% of patients treated with 45 mg ustekinumab, 89% of patients treated with 90 mg ustekinumab and 10% of patients treated with placebo reached PASI 50 in PHOENIX 2 (Table 2.3).

### Response over time

In PHOENIX 1, significantly greater proportions of ustekinumab-treated patients had PASI 50 responses (9% and 10% for the 45 mg and 90 mg groups, respectively) compared with placebo (2%) by Week 2 ( $p < 0.001$ ). Significantly greater proportions of patients treated with ustekinumab achieved PASI 75 responses (9% and 12% for the 45 mg and 90 mg ustekinumab groups, respectively) compared with placebo (0.4%) by Week 4 ( $p < 0.001$ ). Maximum response was generally achieved by Week 24 in the 45 mg and 90 mg ustekinumab treatment groups, and response rates were generally sustained through Week 36 (Figure 2.1). In PHOENIX 1, PASI 75 rates at Week 24 were 76% for the 45 mg group, and 85% for the 90 mg group. Higher response rates were observed in patients receiving ustekinumab 90 mg than in those receiving ustekinumab 45 mg by Week 16 and these higher response rates were sustained through Week 36 (Figure 1). Similar results were observed in the PHOENIX 2 study through Week 28.



**Figure 2.1: PASI 75 response over time in PHOENIX 1 and 2**

In prespecified analyses of efficacy by body weight in PHOENIX 1 and PHOENIX 2, no consistent pattern of dose response was seen in patients  $\leq 100$  kg. In patients who weighed  $>100$  kg, higher PASI 75 response rates were seen with 90 mg dosing compared with 45 mg dosing, and a higher proportion of patients receiving 90 mg dosing had PGA scores of cleared or minimal compared with patients receiving 45 mg dosing (Table 2.4).

**Table 2.4: Clinical Outcomes by Weight – PHOENIX 1 and PHOENIX 2**

<b>Week 12</b>						
	<b>PHOENIX 1</b>			<b>PHOENIX 2</b>		
	<b>Placebo</b>	<b>Ustekinumab</b>		<b>Placebo</b>	<b>Ustekinumab</b>	
		<b>45 mg</b>	<b>90 mg</b>		<b>45 mg</b>	<b>90 mg</b>
Patients randomized at Week 0	255	255	256	410	409	411
PASI 75 response by weight						
≤ 100 kg						
N	166	168	164	290	297	289
PASI 75 response	6 (4%)	124 (74%)	107 (65%)	12 (4%)	218 (73%)	225 (78%)
>100 kg						
N	89	87	92	120	112	121
PASI 75 response	2 (2%)	47 (54%)	63 (68%)	3 (3%)	55 (49%)	86 (71%)
PGA of Cleared or Minimal by weight						
≤ 100 kg						
N	166	168	164	290	297	289
PGA response	7 (4%)	110 (65%)	104 (63%)	16 (6%)	219 (74%)	217 (75%)
>100 kg						
N	89	87	92	120	112	121
PGA response	3 (3%)	44 (51%)	54 (59%)	4 (3%)	59 (53%)	85 (70%)
<b>Week 28</b>						
	<b>PHOENIX 1</b>			<b>PHOENIX 2</b>		
	<b>Ustekinumab</b>			<b>Ustekinumab</b>		
	<b>45 mg</b>	<b>90 mg</b>		<b>45 mg</b>	<b>90 mg</b>	
N	250	243		397	400	
PASI 75 response by weight						
≤ 100 kg						
N	164	153		287	280	
PASI 75 response	130 (79%)	124 (81%)		217 (76%)	226 (81%)	
>100 kg						
N	86	90		110	119	
PASI 75 response	48 (56%)	67 (74%)		59 (54%)	88 (74%)	
PGA of Cleared or Minimal by weight						
≤ 100 kg						
N	164	153		287	280	
PGA response	107 (65%)	107 (70%)		194 (68%)	208 (74%)	
>100 kg						
N	86	90		110	119	
PGA response	40 (47%)	54 (60%)		49 (45%)	71 (60%)	

### Therapeutic benefit of long-term continuous use

At Week 40 in PHOENIX 1, among patients who were PASI 75 responders at both weeks 28 and 40, 162 patients were re-randomized to receive ustekinumab at 45 mg and 90 mg given every 12 weeks (maintenance treatment) and 160 were re-randomized to receive placebo (treatment withdrawal). Maintenance of PASI 75 was significantly superior with continuous maintenance treatment compared with treatment withdrawal ( $p < 0.001$ ) through at least 1.5 years of follow-up. Similar results were seen with each dose of ustekinumab.

At 1 year (Week 52), 89% of patients re-randomized to maintenance treatment were PASI 75 responders compared with 63% of patients re-randomized to placebo (treatment withdrawal) ( $p < 0.001$ ) (Table 2.5). At Week 76, 84% of patients re-randomized to maintenance treatment were PASI 75 responders compared with 19% of patients re-randomized to placebo (treatment withdrawal) ( $p < 0.001$ ). Through 18 months (Week 76), the proportion of subjects in the combined maintenance treatment group who were PASI 50 responders remained consistently at greater than 95%. By contrast, the proportion of PASI 50 responders in the combined withdrawal group progressively decreased over time such that by Weeks 52 and 76, only 50% and 31% remained as PASI 50 responders respectively. Among patients withdrawn from treatment, the rates of loss of the various PASI responses (PASI 50, 75, 90) were generally comparable in all groups regardless of dose. No rebound of psoriasis occurred in patients who were randomized to treatment withdrawal. Among the patients who reached PASI 75 response at weeks 28 and 40 and were re-randomized to maintenance treatment, 82% were PASI 75 responders at 3 years (Week 148). At 5 years (Week 244), 80% of patients (112/140) re-randomized to maintenance treatment were PASI 75 responders.

**Table 2.5: Summary of PASI response from Week 40 through Week 76 in subjects randomized at Week 40 in PHOENIX 1**

	Ustekinumab		Ustekinumab		Ustekinumab	
	45 mg		90 mg		Combined	
	Placebo	q12 wks	Placebo	q12 wks	Placebo	q12 wks
Patients randomized at Week 40	73	77	87	85	160	162
Week 52 N	73	77	86	85	159	162
≥90% improvement	27 (37.0%)	45 (58.4%)	33 (38.4%)	60 (70.6%)	60 (37.7%)	105 (64.8%)
≥75% improvement	47 (64%)	67 (87.0%)	53 (61.6%)	77 (90.6%)	100 (62.9%)	144 (88.9%)
≥50% improvement	63 (86%)	75 (97.4%)	71 (82.6%)	83 (97.6%)	134 (84.3%)	158 (97.5%)
Week 76 N	71	77	85	82	156	159
≥90% improvement	5 (7.0%)	38 (49.4%)	4 (4.7%)	52 (63.4%)	9 (5.8%)	90 (56.6%)
≥75% improvement	14 (19.7%)	63 (81.8%)	15 (17.6%)	71 (86.6%)	29 (18.6%)	134 (84.3%)
≥50% improvement	22 (31.0%)	74 (96.1%)	27 (31.8%)	79 (96.3%)	49 (31.4%)	153 (96.2%)

### Efficacy of retreatment

In PHOENIX 1, after randomized withdrawal from therapy at week 40, patients reinitiated their original ustekinumab treatment regimen after a loss of  $\geq 50\%$  of PASI improvement. Retreatment with ustekinumab resulted in 71% of evaluated patients regaining PASI 75 response within 8 weeks after reinitiating therapy and 85% of evaluated patients regaining PASI 75 response within 12 weeks after reinitiating therapy.

### Dosing interval adjustment

In PHOENIX 1, Week 28 and Week 40 partial responders and Week 40 nonresponders were adjusted from every-12-week to every-8-week dosing. Approximately 40%-50% of Week 28 partial responders to every-12-week dosing achieved PASI 75 response after adjustment to every-8-week dosing and this proportion of PASI 75 responders was maintained through Week 52. A similar proportion of patients who were PASI 75 responders at Week 28 and subsequently became partial responders or nonresponders at Week 40 achieved PASI 75 response following a dosing interval adjustment to every 8 weeks.

In PHOENIX 2, among patients initially randomized to 90 mg dosing who were partial responders at Week 28, dosing adjustment to every 8 weeks resulted in consistently superior efficacy as compared with continued every 12 weeks dosing: Partial responders randomized to 90 mg every 8 weeks achieved PASI 75 response at more visits between Weeks 40 and 52 than partial responders randomized to continue 90 mg every 12 weeks ( $p = 0.014$ ), and a higher proportion of subjects achieved a PASI 75 response at Week 52 (68.8% with every 8 weeks dosing versus 33.3% with every 12 weeks dosing;  $p = 0.004$ ). Among patients initially randomized to 45 mg dosing who were partial responders at Week 28, response rates were not higher among patients in whom dosing was adjusted to every 8 weeks compared with patients who continued every 12 weeks dosing.

### Quality of life

In PHOENIX 1 and 2, the mean baseline DLQI scores ranged from 11 to 12. In PHOENIX 1, the mean baseline SF-36 Physical Component ranged from 47-49 and the mean baseline SF-36 Mental Component was approximately 50. Quality of life improved significantly in patients randomized to 45 mg or 90 mg ustekinumab compared with patients randomized to placebo as evaluated by DLQI in PHOENIX 1 and 2 and SF-36 in PHOENIX 1. Quality of life improvements were significant as early as 2 weeks in patients treated with ustekinumab ( $p < 0.001$ ) and these improvements were maintained over time with continued dosing.

In PHOENIX 1, 65% and 71% of patients treated with 45 mg and 90 mg of ustekinumab, respectively, showed a clinically meaningful reduction (5 or more points) in DLQI from baseline at week 12 compared to 18% in placebo group ( $p < 0.001$  for both groups compared with placebo). Furthermore, 33% and 34% of patients treated with 45 mg and 90 mg of ustekinumab, respectively, showed a DLQI score of 0 compared to 1% in the placebo group ( $p < 0.001$  for both groups compared with placebo), indicating no impairment in QOL from disease or treatment in these patients. In PHOENIX 2, 72% and 77% of patients treated with 45 mg and 90 mg of ustekinumab, respectively, showed a clinically meaningful reduction (5 or more points) in DLQI from baseline at Week 12 compared to 21% in placebo group ( $p < 0.001$  for both groups compared with placebo). In addition, 37% and 39% of patients treated with 45 mg and 90 mg of ustekinumab, respectively, showed a DLQI score of 0 compared to 1% in the placebo group ( $p < 0.001$  for both groups compared with placebo).

In PHOENIX 1, the median baseline NAPSI score for nail psoriasis was 4.0 and the median number of fingernails involved with psoriasis was 8.0. Nail psoriasis improved significantly in patients randomized to 45 mg or 90 mg ustekinumab compared with patients randomized to placebo when measured by the NAPSI score ( $p \leq 0.001$ ). Improvements in physical and mental component summary scores of the SF-36 and in the Itch Visual Analogue Scale (VAS) were also significant in each ustekinumab treatment group compared with placebo ( $p < 0.001$ ). In

PHOENIX 2, the Hospital Anxiety and Depression Scale (HADS) and Work Limitations Questionnaire (WLQ) were also significantly improved in each ustekinumab treatment group compared with placebo (p<0.001).

**ACCEPT**

Significantly greater proportions of subjects treated with ustekinumab 45 mg (67%; p = 0.012) or 90 mg (74%; p < 0.001) were PASI 75 responders at Week 12 compared with the etanercept group (56.8%). PASI 90 response was observed in 36% and 45 % of patients in the ustekinumab 45 mg and 90 mg groups, respectively, compared with 23% of patients receiving etanercept (p<0.001 for each comparison versus etanercept). PASI 100 response was observed in 12% and 21% of patients in the ustekinumab 45 mg and 90 mg groups, respectively, compared to 6% of patients receiving etanercept (Table 2.6). In addition, a greater proportion of patients in the ustekinumab 45 mg and 90 mg treatment groups achieved a PGA score of “cleared” or “minimal” (65 % and 71 %, respectively) compared with patients in the etanercept treatment group (49 %) (p<0.001 for each comparison versus etanercept).

**Table 2.6 Clinical outcomes at Week 12: ACCEPT**

	ACCEPT		
	Etanercept (50mg twice a week)	Ustekinumab (at week 0 and week 4)	
		45 mg	90 mg
Patients randomized	347	209	347
<b><u>PASI response</u></b>			
PASI 50 response	286 (82%)	181 (87%)	320 (92%) <sup>a</sup>
PASI 75 response	197 (57%)	141 (67%) <sup>b</sup>	256 (74%) <sup>a</sup>
PASI 90 response	80 (23%)	76 (36%) <sup>a</sup>	155 (45%) <sup>a</sup>
PASI 100 response	22 (6%)	25 (12%) <sup>c</sup>	74 (21%) <sup>a</sup>
<b>PGA of Cleared or Minimal<sup>a</sup></b>	170 (49%)	136 (65%) <sup>a</sup>	245 (71%) <sup>a</sup>
<b>PASI 75 RESPONSE BY WEIGHT</b>			
≤100 kg			
N	251	151	244
PASI 75 response	154 (61%)	109 (72%)	189 (77%)
>100 kg			
N	96	58	103
PASI 75 response	43 (45%)	32 (55%)	67 (65%)
<b>PGA OF CLEARED OR MINIMAL BY WEIGHT</b>			
≤100 kg			
N	251	151	244
PGA response	131 (52%)	110 (73%)	185 (76%)
>100 kg			
N	96	58	103
PGA response	39 (41%)	26 (45%)	60 (58%)

<sup>a</sup> p < 0.001 for ustekinumab 45 mg or 90 mg comparison with etanercept.

<sup>b</sup> p = 0.012 for ustekinumab 45 mg comparison with etanercept.

<sup>c</sup> p = 0.020 for ustekinumab 45 mg comparison with etanercept.

Greater proportions of subjects in the ustekinumab 45 mg and 90 mg groups achieved PASI 75 responses when compared with subjects in the etanercept group regardless of a subject's previous psoriasis medication history.

### **Plaque Psoriasis – Pediatrics (12 to 17 years of age)**

#### **Study demographics and trial design**

The efficacy of STELARA<sup>®</sup> was studied in 110 pediatric patients 12 to 17 years of age, in a multicenter, phase 3, randomized, double blind, placebo controlled study (CADMUS). Two distinct, subcutaneous weight based dosages of STELARA<sup>®</sup> were studied. Randomization was stratified by investigational site and baseline weight ( $\leq 60$  kg or  $> 60$  kg).

Patients were randomized to one of four treatment groups (Groups 1, 2, 3a and 3b) at week 0 as follows:

Group 1: Ustekinumab half-standard dosage at Weeks 0 and 4 followed by doses every 12 weeks, with the last dose at Week 40.

Group 2: Ustekinumab standard dosage at Weeks 0 and 4 followed doses every 12 weeks, with the last dose at Week 40.

Group 3: Placebo at Weeks 0 and 4. At Weeks 12 and 16, subjects crossed over to receive either ustekinumab half-standard dosage (Group 3a) or standard dosage (Group 3b) followed by doses every 12 weeks, with the last dose at Week 40. The dosage assignment (Group 3a or 3b) following crossover was randomly assigned at week 0, ensuring that the assignment remained double blinded throughout the duration of the study.

All subjects were followed for efficacy through Week 52 and for safety through Week 60.

Adolescent patients with a diagnosis of plaque-type psoriasis for at least 6 months prior to first study agent administration, who had moderate to severe disease, and with PASI  $\geq 12$ , PGA  $\geq 3$  and BSA involvement of at least 10%, and who were candidates for systemic or phototherapy, were eligible for the study. 43% and 11% of subjects had prior exposure to conventional systemic or biologic therapies respectively.

The primary endpoint was the proportion of patients who achieved a PGA score of cleared (0) or minimal (1) at Week 12. Secondary endpoints included PASI 75 at Week 12. Subjects who discontinued study treatment due to lack of efficacy, an adverse event (AE) of psoriasis, or who started a protocol-prohibited medication/therapy prior to Week 12 were considered as non-responders. Subject with missing PGA or PASI scores at Week 12 were considered non-responders. For the Week 12 analysis, any subject receiving moderate to high potency topical steroid preparation were considered as non-responders.

The study population were predominantly Caucasian (89%) and 51% were female. Median body weight was 61.6 kg, 56% had a body weight of between 50 and 70 kg and the median body mass index was 22.15 kg/m<sup>2</sup>. Median psoriasis duration was 5.29 years with median age at onset of 10 years. The majority of subjects (70.0%) were 15 to 17 years of age, with a median age of 15.5 years. 57% of subjects had  $\geq 20\%$  body surface area affected with psoriasis and median PASI score was 18.8 (range 12-51), and 62% and 38% of subjects had PGA scores of moderate and marked/severe respectively.

**Table 2.7: Summary of patient demographics for CADMUS**

Study #	Trial design	Dosage, route of administration and duration	Study subjects (n=number)	Mean age (Range)	Gender N (%)
CNTO1275PS O3006 (CADMUS)	Double-Blind Placebo-Controlled	Fixed doses (weight based): Placebo (N = 37) Placebo → Half-standard dosage (N = 19) Placebo → Standard dosage (N = 18) Half-standard dosage Weeks 0, 4 then q12w (N = 37) Standard dosage Weeks 0, 4 then q12w (N = 36)	N=110	15,2 (12,17)	M=54 (49%) F=56 (51%)

## Study Results

At Week 12, subjects treated with STELARA<sup>®</sup> showed significantly greater improvement in their psoriasis compared with placebo (Table 2.8).

**Table 2.8: Summary of Primary and Secondary End-points at Week 12**

	Placebo	STELARA <sup>®</sup> Half Standard Dose	STELARA <sup>®</sup> Standard Dose
	n (%)	n (%)	n (%)
Patients randomized at Week 0	37	37	36
Number of patients who achieved a PGA score of cleared (0) or minimal (1)	2 (5.4%)	25 (67.6%) <sup>a</sup>	25 (69.4%) <sup>a</sup>
PASI 75 responders	4 (10.8%)	29 (78.4%) <sup>a</sup>	29 (80.6%) <sup>a</sup>

<sup>a</sup> p<0.001

P-values are based on the Cochran-Mantel-Haenszel chi-square test stratified by baseline weight (<=60kg, > 60kg). Multiplicity was controlled by sequential testing of endpoints.

All patients were followed for efficacy for up to 52 weeks following first administration of study agent. The PGA scores of cleared (0) or minimal (1) and PASI 75 responders at Week 52 are summarized in Table 2.9.

**Table 2.9: Summary of Secondary Endpoints at Week 52**

	STELARA <sup>®</sup> Half- Standard Dose	STELARA <sup>®</sup> Standard Dose
Number of evaluable subjects at Week 52	n=34	n=35
Number of patients who achieved a PGA score of cleared (0) or minimal (1)	20 (58.8%)	20 (57.1%)
PASI 75 responders	23 (67.6%)	28 (80%)



## **Psoriatic Arthritis**

### **Study demographics and trial design**

The safety and efficacy of STELARA<sup>®</sup> was assessed in two multicenter, randomized, double-blind, placebo-controlled, phase 3 studies, PSUMMIT I and PSUMMIT II, in patients with active psoriatic arthritis. Patients were randomized to receive treatment with either STELARA<sup>®</sup> 45 mg, 90 mg, or placebo subcutaneous injections at Weeks 0 and 4 followed by every 12 week (q12w) dosing. The primary endpoint in these studies was the reduction in the signs and symptoms of psoriatic arthritis (PsA) as measured by the percentage of ACR 20 responders at Week 24. Secondary endpoints included change from baseline in Disability Index of the Health Assessment Questionnaire (HAQ-DI), PASI 75, ACR 50, ACR 70 and change from baseline in total radiographic scores of the hands and feet at Week 24. Efficacy data were collected and analyzed through Week 52.

These studies included 927 adult patients (≥18 years) who had active psoriatic arthritis (≥5 swollen joints and ≥5 tender joints, despite disease modifying antirheumatic (DMARD) and/or nonsteroidal anti-inflammatory (NSAID) therapy. Methotrexate (MTX) use was allowed during the studies but was not mandatory. Approximately 50% of patients continued on stable doses of MTX (≤25 mg/week). In PSUMMIT I and PSUMMIT II, 80% and 86% of the patients, respectively, had been previously treated with DMARDs.

In PSUMMIT I patients, who had been previously treated with anti-TNF $\alpha$  therapy, prior to the first study dose, were excluded. In PSUMMIT II, the majority of patients (58%, n=180) had been previously treated with one or more an anti-TNF $\alpha$  agent(s) for at least 8 weeks (14 weeks with infliximab) or had discontinued anti-TNF $\alpha$  for intolerance at any time. Among the patients who had been previously treated with an anti-TNF $\alpha$  agent, over 70% had discontinued their anti-TNF $\alpha$  treatment for lack of efficacy or intolerance.

Patients with each subtype of psoriatic arthritis were enrolled, including polyarticular arthritis with no evidence of rheumatoid nodules (39%, N=362), spondylitis with peripheral arthritis (28%, N=255), asymmetric peripheral arthritis (21%, N=193), distal interphalangeal (DIP) arthritis (12%, N=112) and arthritis mutilans (0.5%, N=5). Over 70% and 40% of the patients in both studies had enthesitis and dactylitis at baseline, respectively.

**Table 2.10: Summary of patient demographics in PSUMMIT I and PSUMMIT II**

<b>Study #</b>	<b>Trial design</b>	<b>Dosage, route of administration and duration</b>	<b>Study subjects (n=number)</b>	<b>Mean age (Range)</b>	<b>Gender</b>
CNT01275 PSA3001 (PSUMMIT I)	Double-Blind Placebo- Controlled	Placebo SC (n=206): Placebo SC at Weeks 0, 4, 16, and 20 Placebo→45 mg SC at Weeks 24 and 28 followed by q12w dosing through Week 88  45 mg SC (n=205): 45 mg SC at Weeks 0 and 4 followed by q12w dosing through Week 88	615	47.1 (18, 81)	M=330 F=285

		90 mg SC (n=204): 90 mg SC at Weeks 0 and 4 followed by q12w dosing through Week 88			
CNTO1275 PSA3002 (PSUMMIT II)	Double-Blind Placebo- Controlled	Placebo SC (n=104): Placebo SC at Weeks 0, 4, 16, and 20 45 mg SC at Weeks 24 and 28 followed by q12w dosing through Week 40  45 mg SC (n=103): 45 mg SC at Weeks 0 and 4 followed by q12w dosing through Week 40  90 mg SC (n=105): 90 mg SC at Weeks 0 and 4 followed by q12w dosing through Week 40	312	48.0 (19, 75)	M=148 F=164

## Study Results

### Reduction in Signs and Symptoms

In both studies, a significantly greater proportion of patients achieved ACR 20 and ACR 50 responses at Week 24 in the STELARA<sup>®</sup> 45 mg and 90 mg groups compared to placebo (see Table 2.8). In PSUMMIT I, a significantly greater proportion of patients and in PSUMMIT II, a numerically greater proportion of patients (p=NS) achieved ACR 70 responses in the STELARA<sup>®</sup> 45 mg and 90 mg groups compared to placebo (see Table 2.11).

	PSUMMIT I			PSUMMIT II		
	Placebo (N=206)	STELARA <sup>®</sup>		Placebo (N= 104)	STELARA <sup>®</sup>	
		45 mg (N= 205)	90 mg (N= 204)		45 mg (N= 103)	90 mg (N= 105)
ACR 20	47 (23%)	87 (42%) <sup>a</sup>	101 (50%) <sup>a</sup>	21 (20%)	45 (44%) <sup>a</sup>	46 (44%) <sup>a</sup>
ACR 50	18 (9%)	51 (25%) <sup>a</sup>	57 (28%) <sup>a</sup>	7 (7%)	18 (17%) <sup>b</sup>	24 (23%) <sup>a</sup>
ACR 70	5 (2%)	25 (12%) <sup>a</sup>	29 (14%) <sup>a</sup>	3 (3%)	7 (7%) <sup>c</sup>	9 (9%) <sup>c</sup>

<sup>a</sup> p<0.001, <sup>b</sup> p<0.05, <sup>c</sup> p= NS

An ACR 20 response (Felson et al, 1995) was defined as:

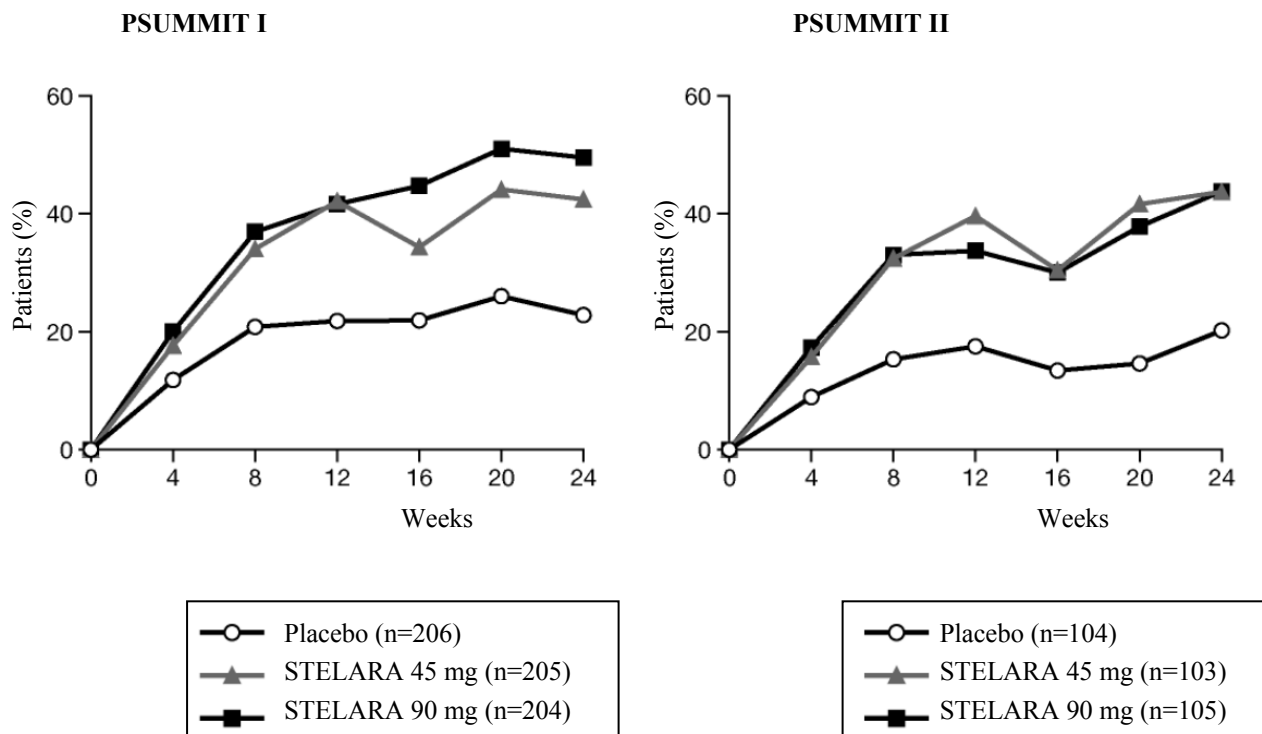
- ≥ 20% improvement in swollen joint count (66 joints) and tender joint count (68 joints); and
- ≥ 20 % improvement in ≥3 of the following 5 assessments:
  - Patient's assessment of pain [Visual Analog Scale (VAS)]
  - Patient's global assessment of disease activity (VAS)
  - Physician's global assessment of disease activity (VAS)
  - Patient's assessment of physical function as measured by the HAQ-DI
  - CRP

ACR 50 or ACR 70 are similarly defined.

The time course for ACR 20 response rates during the first 24 weeks in both studies for patients receiving STELARA<sup>®</sup> or placebo are summarized in Figure 2.2. During the controlled phase of

the studies, ACR 20 responses showed improvement at the first assessment (Week 4) and maximum responses were achieved at Week 20 or 24. ACR 20, 50 and 70 responses continued to improve or were maintained through Week 52.

**Figure 2.2: Percent of patients achieving ACR 20 response through Week 24**



In PSUMMIT I, of 205 subjects randomized to STELARA<sup>®</sup> 45 mg, 153 continued the same dose and were available for evaluation at Week 52. Among those, ACR 20, 50 and 70 responses were achieved by 99 (64.7%), 57 (37.3%) and 34 (22.2%) subjects respectively. Of 204 subjects randomized to STELARA<sup>®</sup> 90 mg, 185 were available for evaluation at Week 52. Among those, ACR 20, 50 and 70 responses were achieved by 120 (64.9%), 74 (40%) and 41 (22.2%) subjects respectively.

In PSUMMIT II, of 103 subjects randomized to STELARA<sup>®</sup> 45 mg, 68 continued the same dose and were available for evaluation at Week 52. Among those, ACR 20, 50, and 70 responses were achieved by 41 (60.3%), 23 (33.8%) and 11 (16.2%) subjects respectively. Of 105 subjects randomized to STELARA<sup>®</sup> 90 mg, 83 were available for evaluation at Week 52. Among those, ACR 20, 50 and 70 responses were achieved by 49 (59%), 26 (31.3%) and 17 (20.5%) subjects respectively.

Additionally, within each weight group ( $\leq 100$  kg and  $> 100$  kg), ACR 20, ACR 50 and ACR 70 responses were consistently higher in the STELARA<sup>®</sup> 45 mg and 90 mg groups than in the placebo group (see Table 2.12).

**Table 2.12: Number of patients who achieved ACR 20, ACR 50 and ACR 70 responses by weight at Week 24**

	PSUMMIT I			PSUMMIT II		
	Placebo (N=206)	STELARA <sup>®</sup>		Placebo (N= 104)	STELARA <sup>®</sup>	
		45 mg (N= 205)	90 mg (N= 204)		45 mg (N= 103)	90 mg (N= 105)
Patients randomized with weight ≤100 kg at baseline	154	153	154	74	74	73
ACR 20	39 (25%)	67 (44%)	78 (51%)	17 (23%)	32 (43%)	34 (47%)
ACR 50	14 (9%)	38 (25%)	48 (31%)	6 (8%)	15 (20%)	21 (29%)
ACR 70	5 (3%)	20 (13%)	26 (17%)	3 (4%)	6 (8%)	8 (11%)
Patients randomized with weight >100 kg at baseline	52	52	50	30	29	31
ACR 20	8 (15%)	20 (38%)	23 (46%)	4 (13%)	13 (45%)	12 (39%)
ACR 50	4 (8%)	13 (25%)	9 (18%)	1 (3%)	3 (10%)	3 (10%)
ACR 70	0	5 (10%)	3 (6%)	0	1 (3%)	1 (3%)

STELARA treatment resulted in significantly greater improvement compared with placebo for each ACR component at week 24 (see Table 2.13).

**Table 2.13: Median percent improvement from baseline in ACR components at Week 24**

	PSUMMIT I			PSUMMIT II		
	Placebo (N=206)	STELARA		Placebo (N=104)	STELARA	
		45 mg (N= 205)	90 mg (N= 204)		45 mg (N= 103)	90 mg (N= 105)
Number of swollen joints <sup>d</sup>	21.54	58.82 <sup>a</sup>	60.00 <sup>a</sup>	0.00	52.94 <sup>b</sup>	50.00 <sup>c</sup>
Number of tender joints <sup>e</sup>	13.61	45.45 <sup>a</sup>	51.51 <sup>a</sup>	0.00	33.33 <sup>a</sup>	35.00 <sup>c</sup>
Patient's assessment of pain <sup>f</sup>	0.00	31.33 <sup>a</sup>	42.58 <sup>a</sup>	0.00	24.19 <sup>a</sup>	24.29 <sup>a</sup>
Patient global assessment <sup>f</sup>	4.11	32.84 <sup>a</sup>	42.44 <sup>a</sup>	0.00	21.25 <sup>a</sup>	22.54 <sup>a</sup>
Physician global assessment <sup>f</sup>	17.64	48.39 <sup>a</sup>	55.91 <sup>a</sup>	0.83	36.67 <sup>a</sup>	36.11 <sup>a</sup>
Disability index (HAQ-DI) <sup>g</sup>	0.00	22.22 <sup>a</sup>	32.46 <sup>a</sup>	0.00	12.50 <sup>a</sup>	14.29 <sup>a</sup>
CRP (mg/dL) <sup>h</sup>	0.00	38.56 <sup>a</sup>	48.30 <sup>a</sup>	0.00	25.61 <sup>c</sup>	33.69 <sup>a</sup>

<sup>a</sup> p<0.001

<sup>b</sup> p<0.05

<sup>c</sup> p<0.01

<sup>d</sup> Number of swollen joints counted (0-66)

<sup>e</sup> Number of tender joints counted (0-68)

<sup>f</sup> Visual analogue scale; 0= best, 10=worst.

<sup>g</sup> Disability Index of the Health Assessment Questionnaire; 0 = best, 3 = worst, measures the patient's ability to perform the following: dress/groom, arise, eat, walk, reach, grip, maintain hygiene, and maintain daily activity.

<sup>h</sup> CRP: (Normal Range 0.0-1.0 mg/dL)

In PSUMMIT I and PSUMMIT II, the proportion of subjects with good or moderate Disease Activity Index Score 28 using C-reactive protein (DAS28-CRP) responses and the proportion of subjects in DAS28 remission were greater in both STELARA<sup>®</sup>-treated groups compared to placebo at Week 24. DAS28-CRP responses were maintained through Week 52.

### **Methotrexate Use**

The proportion of patients achieving ACR responses were consistently greater in patients treated with STELARA<sup>®</sup> than those treated with placebo regardless of concomitant MTX use.

Responses observed in the STELARA<sup>®</sup> groups were similar in patients receiving or not receiving concomitant MTX. ACR responses were maintained through Week 52.

<b>Table 2.14: Summary of patients achieving ACR 20, ACR 50 and ACR 70 responses through Week 24 by methotrexate usage</b>						
<b>PSUMMIT I</b>						
	<i>Receiving MTX at baseline</i>			<i>Not receiving MTX at baseline</i>		
	<b>STELARA<sup>®</sup></b>			<b>STELARA<sup>®</sup></b>		
	<b>Placebo (N=206)</b>	<b>45 mg (N= 205)</b>	<b>90 mg (N= 204)</b>	<b>Placebo (N=206)</b>	<b>45 mg (N= 205)</b>	<b>90 mg (N= 204)</b>
Patients randomized	96	99	101	110	106	103
ACR 20	25 (26%)	43 (43%)	46 (46%)	22 (20%)	44 (42%)	55 (53%)
ACR 50	8 (8%)	23 (23%)	27 (27%)	10 (9%)	28 (26%)	30 (29%)
ACR 70	2 (2%)	11 (11%)	13 (13%)	3 (3%)	14 (13%)	16 (16%)
<b>PSUMMIT II</b>						
	<i>Receiving MTX at baseline</i>			<i>Not receiving MTX at baseline</i>		
	<b>STELARA<sup>®</sup></b>			<b>STELARA<sup>®</sup></b>		
	<b>Placebo (N=104)</b>	<b>45 mg (N= 103)</b>	<b>90 mg (N= 105)</b>	<b>Placebo (N=104)</b>	<b>45 mg (N= 103)</b>	<b>90 mg (N= 105)</b>
Patients randomized	49	54	52	55	49	53
ACR 20	14 (29%)	27 (50%)	21 (40%)	7 (13%)	18 (37%)	25 (47%)
ACR 50	4 (8%)	10 (19%)	12 (23%)	3 (5%)	8 (16%)	12 (23%)
ACR 70	2 (4%)	4 (7%)	3 (6%)	1 (2%)	3 (6%)	6 (11%)

### **Prior Anti-TNF $\alpha$ therapy**

PSUMMIT II evaluated 180 patients who were previously treated with one or more anti-TNF $\alpha$  agents for at least 8 weeks (14 weeks with infliximab), or had documented intolerance of anti-TNF $\alpha$  therapy at any time in the past.

Among patients previously treated with anti-TNF $\alpha$  agents, a greater proportion of STELARA<sup>®</sup>-treated patients in both the 45 mg and 90 mg groups achieved an ACR 20 response at Week 24 compared to placebo (37% and 34% vs 15%). ACR 20 response was generally maintained through Week 52.

### **Enthesitis and Dactylitis**

For patients with enthesitis and/or dactylitis at baseline, in PSUMMIT I, greater improvement in enthesitis and dactylitis score was observed in the STELARA<sup>®</sup> 45 mg and 90 mg groups compared to placebo. For enthesitis, the median improvement was 43% and 50% for each dose group respectively, compared to 0% for placebo. For dactylitis, the median improvement was 75% and 71% for each dose group respectively, compared to 0% for placebo. In PSUMMIT II, a greater improvement was observed in enthesitis score in both doses and in dactylitis score in the 90 mg group compared with the placebo group. In both studies, improvement in enthesitis score and dactylitis score were maintained at Week 52.

### **Psoriasis Skin Response**

In PSUMMIT I and PSUMMIT II, the proportion of patients with psoriasis involvement of  $\geq 3\%$  BSA at baseline who achieved a  $\geq 75\%$  improvement in the PASI assessment at Week 24 was

significantly greater in the STELARA<sup>®</sup> 45 mg and 90 mg groups compared with the placebo group (see Table 2.15). In both studies the proportion of patients achieving the PASI 75 response was maintained through Week 52.

	PSUMMIT I			PSUMMIT II		
	STELARA <sup>®</sup> <sup>a</sup>			STELARA <sup>®</sup> <sup>a</sup>		
	Placebo (N= 206)	45 mg (N=205)	90 mg (N=204)	Placebo (N= 104)	45 mg (N=103)	90 mg (N=105)
Patients with ≥3% BSA psoriasis skin involvement at baseline	146	145	149	80	80	81
PASI 75	16 (11%)	83 (57%)	93 (62%)	4 (5%)	41 (51%)	45 (56%)
PASI 90	4 (3%)	60 (41%)	65 (44%)	3 (4%)	24 (30%)	36 (44%)
PASI 100	2 (1%)	29 (20%)	41 (28%)	1 (1%)	13 (16%)	17 (21%)

<sup>a</sup> p<0.001 for 45 mg or 90 mg comparison with placebo.

Additionally, within each weight group (≤100 kg and >100 kg), PASI 75, 90 and 100 responses were consistently higher in the STELARA<sup>®</sup> 45 mg and 90 mg groups than in the placebo group. In both studies, the proportion of patients who achieved a PASI 75 response at Week 24 was consistently higher in STELARA<sup>®</sup> 45 mg and 90 mg groups compared with placebo regardless of concomitant MTX use. PASI 75 responses were maintained through Week 52.

#### Radiographic Response

Structural damage in both hands and feet was assessed by readers unaware of treatment group and order of visits, and expressed as change in total van der Heijde-Sharp score (vdH-S score), modified for PsA by addition of hand distal interphalangeal (DIP) joints, compared to baseline. A pre-specified major secondary endpoint based on the integrated analysis combining data from 927 subjects in both PSUMMIT I and PSUMMIT II was performed. At Week 24, based on this integrated analysis, patients treated with either STELARA<sup>®</sup> 45 mg (n=308, mean change in total vdH-S score=0.40) or 90 mg (n=309, mean change=0.39) demonstrated significantly less progression of structural damage compared to placebo (n=310, mean change=0.97), p<0.05 and p<0.001 for the 45 mg and 90 mg groups, respectively. This effect was demonstrated irrespective of concomitant MTX use, and was maintained through Week 52.

Similar results were seen in PSUMMIT I for patients treated with either STELARA<sup>®</sup> 45 mg (n=205, mean change=0.28) or 90 mg (n=204, mean change=0.17) compared to placebo (n=206, mean change=1.20). In PSUMMIT II, the mean change was 0.66 for 45 mg (n=103), 0.81 for 90 mg (n=105) and 0.51 for placebo (n=104).

#### Physical Function and Health-Related Quality of Life

In PSUMMIT I and PSUMMIT II, physical function and health-related quality of life were assessed using the Disability Index of the Health Assessment Questionnaire (HAQ-DI) and the SF-36 health survey.

Patients treated with STELARA<sup>®</sup> 45 mg and 90 mg showed significant improvement in physical function as assessed by the HAQ-DI at Week 24 as compared to placebo in both PSUMMIT I and PSUMMIT II. The proportion of patients achieving a clinically meaningful ≥0.3 improvement in HAQ-DI score from baseline at Week 24 was also significantly greater in the

STELARA<sup>®</sup> groups when compared with placebo. Improvement was observed at the first assessment (Week 4), reached maximum at Week 12 and was maintained through Week 24. In both studies the improvement in HAQ-DI at Week 24 was consistently greater in the STELARA<sup>®</sup> 45 mg and 90 mg groups compared with placebo regardless of concomitant MTX use. Improvement in HAQ-DI score from baseline was maintained at Week 52.

	PSUMMIT I			PSUMMIT II		
	STELARA			STELARA		
	Placebo (N= 206)	45 mg (N=205)	90 mg (N=204)	Placebo (N= 104)	45 mg (N=103)	90 mg (N=105)
HAQ-DI Baseline Score						
N	204	205	204	104	103	104
Mean (SD)	1.24 (0.647)	1.22 (0.610)	1.22 (0.634)	1.25 (0.723)	1.34 (0.704)	1.29 (0.666)
Median	1.25	1.25	1.25	1.25	1.38	1.25
Improvement in HAQ-DI						
N <sup>c</sup>	206	205	204	104	103	105
Mean (SD)	0.10 (0.390)	0.31 (0.521)	0.40 (0.514)	0.03 (0.380)	0.21 (0.461)	0.22 (0.436)
Median	0.00	0.25 <sup>a</sup>	0.25 <sup>a</sup>	0.00	0.13 <sup>b</sup>	0.25 <sup>a</sup>
HAQ-DI Responders*	58 (28%)	98 (48%) <sup>a</sup>	97 (48%) <sup>a</sup>	17 (16%)	35 (34%) <sup>b</sup>	40 (38%) <sup>a</sup>

<sup>a</sup> p<0.001

<sup>b</sup> p<0.01

<sup>c</sup> Includes all randomized subjects

\*achieving a  $\geq 0.3$  improvement from baseline

In PSUMMIT I, of 205 subjects randomized to STELARA<sup>®</sup> 45 mg, 153 continued the same dose and were available for evaluation at Week 52. Among those, the HAQ-DI response was achieved by 83 (54.2%) subjects. Of 204 subjects randomized to STELARA<sup>®</sup> 90 mg, 185 were available for evaluation at Week 52. Among those, HAQ-DI response was achieved by 102 (55.1%) subjects.

In PSUMMIT II, of 103 subjects randomized to STELARA<sup>®</sup> 45 mg, 68 continued the same dose and were available for evaluation at Week 52. Among those, the HAQ-DI response was achieved by 29 (42.6%) subjects. Of 105 subjects randomized to STELARA<sup>®</sup> 90 mg, 83 were available for evaluation at Week 52. Among those, HAQ-DI response was achieved by 44 (53%) subjects.

In both PSUMMIT I and PSUMMIT II, at Week 24, the change from baseline in the SF-36 physical component summary (PCS) scores was significantly greater in the STELARA 45 mg and 90 mg groups compared with the placebo group. In both studies, the change from baseline in the SF-36 mental component summary (MCS) scores at Week 24 was greater in both STELARA<sup>®</sup> groups compared with the placebo group. In both studies, the change from baseline in the SF-36 PCS and MCS scores was maintained at Week 52.

The DLQI was assessed by comparing the change in DLQI scores from baseline for those patients with  $\geq 3\%$  BSA at baseline. In both studies at Week 24, there was a greater improvement from baseline in DLQI scores in both the STELARA<sup>®</sup> 45 mg and 90 mg groups as compared with placebo and the improvement was maintained at Week 52.

In PSUMMIT II, the improvement from baseline in Functional Assessment of Chronic Illness Therapy-Fatigue (FACIT-F) scores at Week 24 was greater in the STELARA<sup>®</sup> 45 mg and 90 mg groups compared with the placebo group. Similarly, the percentage of patients with clinically meaningful improvement in fatigue from baseline (4 points in FACIT-F) was greater in both dose groups compared with the placebo group. The change from baseline in the FACIT-F scores was maintained at Week 52.

## **DETAILED PHARMACOLOGY**

### **TOXICOLOGY**

The toxicity of ustekinumab was specifically evaluated in a number of nonclinical studies. An overview of these toxicity studies is provided in Table 2.17.

#### **General Toxicity Studies**

In repeated-dose toxicity studies in cynomolgus monkeys, ustekinumab was well tolerated following IV doses up to 45 mg/kg/week for up to 1 month and following twice-weekly SC doses up to 45 mg/kg for 6 months. There were no ustekinumab-related findings in the immunotoxicity and cardiovascular safety pharmacology evaluations. In histopathology evaluations there were no preneoplastic changes observed. No evidence of ustekinumab-related local intolerance was observed in examinations of subcutaneous injection sites in a local tolerance study and in the chronic subcutaneous toxicity study.

The 45 mg/kg dose is approximately 45-fold higher than the highest equivalent dose intended to be administered to patients with psoriasis (based on administration of a 90 mg SC dose to a 90 kg patient) and the average  $C_{max}$  value observed following the last SC 45 mg/kg dose in the 6-month chronic toxicity study in cynomolgus monkeys was approximately 118-fold higher than the median  $C_{max}$  value of ustekinumab observed following 4 weekly 90 mg SC doses in psoriasis patients.

#### **Reproductive Toxicology**

Three developmental toxicity studies were conducted in cynomolgus monkeys. No ustekinumab-related maternal toxicity, abortions, still-births, embryotoxicity, developmental delays, malformations or birth defects were observed at doses up to 45 mg/kg following weekly or twice weekly administration of ustekinumab via the IV or SC routes, respectively. In neonates born from pregnant monkeys treated with ustekinumab, no adverse effects on growth or functional development were observed and no deficits were observed in immunotoxicity evaluations. In a male fertility study in cynomolgus monkeys, no ustekinumab-related effects on mating behaviour, sperm parameters, or serum concentrations of male hormones were observed following twice weekly subcutaneous administration of ustekinumab at doses up to 45 mg/kg.

A female fertility toxicity study was conducted in mice using an analogous antibody that binds to and inhibits IL-12 and IL-23 activity in mice. Twice weekly subcutaneous administration of the anti-mouse IL-12/23 antibody was well tolerated at doses up to 50 mg/kg and no adverse effects on female fertility parameters were observed.



**Table 2.17: Non-Clinical Toxicology Studies with ustekinumab**

Study	Species/ Strain	Route	Duration of Dosing	Doses (mg/kg)	Results
<b>Repeat-Dose Toxicity</b>					
Subchronic toxicity	Monkey/ Cynomolgus	IV	1 month	9, 45 weekly	No treatment-related signs of toxicity.
Subchronic toxicity	Monkey/ Cynomolgus	IV	1 month	9, 45 weekly	No treatment-related signs of toxicity.
Chronic toxicity	Monkey/ Cynomolgus	SC	6 months	22.5, 45 twice weekly	No treatment-related signs of toxicity. No preneoplastic changes observed on histopathology.
<b>Reproductive and Developmental Toxicity</b>					
Embryofetal Development	Monkey/ Cynomolgus	IV	Pregnant females: gestation day 20 to gestation day 50	9, 45 weekly	No maternal or fetal abnormalities were observed.
Embryofetal Development	Monkey/ Cynomolgus	SC	Pregnant females: gestation day 20 – gestation day 51	22.5, 45 twice weekly	A statistically significant increase in maternal 17 $\beta$ -estradiol levels relative to the control group was observed on days 80 and 100 of gestation in the 22.5 and 45 mg/kg groups. However, foetal 17 $\beta$ -estradiol levels were not affected, and there were no other treatment-related maternal or foetal abnormalities observed at either dose level.
Male fertility	Monkey/ Cynomolgus	SC	Males: 13 weeks	22.5, 45 twice weekly	No changes in fertility parameters observed.
Female fertility	Mouse/Crl CD-1	SC	beginning 15 days before cohabitation and continuing through day 7 of presumed gestation	25, 50 twice weekly	No maternal or fetal abnormalities were observed.
Embryofetal and pre- and postnatal development	Monkey/ Cynomolgus	SC	Pregnant females: gestation day 20 – postpartum day 30	22.5, 45 twice weekly	No effects on pregnancy or delivery; or morphological, functional and immunological developmental parameters of offspring. Ustekinumab was detected in the milk of lactating monkeys.
<b>Local Tolerance</b>					
Pharmacokinetics and injection site irritation	Monkey/ Cynomolgus	SC	18 days	45 twice weekly	Minimal signs of local irritation at injection sites were observed, with no associated histopathologic findings.
<b>Other Toxicity Studies</b>					
Tissue cross-reactivity	Human Tissues	In vitro		1.13, 11.3, 113, 225 mg/mL	No binding to nontarget normal human tissues.
Tissue cross-reactivity	Human Tissues	In vitro		1.13, 11.3, 113, 225 mg/mL	No binding to nontarget normal human tissues
Asthma model	Monkey/ Cynomolgus	IV	Single dose	9, 45	No exacerbation of pulmonary function or cellular responses.
Asthma model	Monkey/ Cynomolgus	IV	1 week	45	No exacerbation of pulmonary function or cellular responses.

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PART III: CONSUMER INFORMATION

Pr **STELARA**<sup>®</sup>  
 ‘stel ar’ a’  
 ustekinumab Injection

This leaflet is part III of a three-part "Product Monograph" published when STELARA<sup>®</sup> was approved for sale in Canada and is designed specifically for Consumers. This leaflet is a summary and will not tell you everything about STELARA<sup>®</sup>. Contact your doctor or pharmacist if you have any questions about the drug.

**ABOUT THIS MEDICATION**

**What the medication is used for:**

**Adults with Plaque Psoriasis**

STELARA<sup>®</sup> is a prescription medicine that is approved for adults with moderate to severe plaque psoriasis that is chronic (doesn't go away) .

**Adults with Psoriatic Arthritis**

STELARA<sup>®</sup> is a prescription medicine that is approved for adults with active psoriatic arthritis

Psoriatic arthritis is an inflammatory disease of the joints, usually accompanied by psoriasis. If you have active psoriatic arthritis, you will be given STELARA<sup>®</sup> by injection under the skin, alone or in combination with methotrexate, to reduce signs and symptoms of your arthritis, help improve your ability to perform daily activities (such as dressing, walking and climbing stairs) and improve your psoriasis.

**Children 12 to 17 years of age with Plaque Psoriasis**

STELARA<sup>®</sup> is a prescription medicine that is approved for adolescent patients from the age of 12 to 17 years of age with moderate to severe plaque psoriasis that is chronic (doesn't go away) and who have had an inadequate response to other treatments.

**What it does:**

STELARA<sup>®</sup> blocks the action of two proteins in your body called interleukin 12 (IL-12) and interleukin 23 (IL-23). In people with psoriasis and/or psoriatic arthritis, their immune system may attack parts of their body and that attack uses IL-12 and IL-23. Ustekinumab can block the IL-12 and IL-23 from causing the immune system to attack the skin, nails and joints.

**When it should not be used:**

- after the expiration date on the label;
- if the seal is broken;
- if the liquid is discoloured, cloudy or you can see other particulate matter floating in it;

- if you know or think that it may have been exposed to extreme temperatures (such as accidentally frozen or heated);
- if you have had an allergic reaction to STELARA<sup>®</sup>, or any of the other ingredients in STELARA<sup>®</sup>. See below for a complete list of ingredients in STELARA<sup>®</sup>.
- if you have a serious infection such as tuberculosis, infections caused by bacteria or fungi, and bacterial infections that have spread throughout the body (sepsis).

You should not receive a live vaccine while taking STELARA<sup>®</sup>.

Always keep medicine out of the reach of children.

**What the medicinal ingredient is:**

ustekinumab

**What the important nonmedicinal ingredients are:**

sucrose, L-histidine, L-histidine monohydrochloride monohydrate, polysorbate 80 and water for injection. No preservatives are present.

**What dosage forms it comes in:**

Single-use vial<sup>†</sup> or pre-filled syringe: 45 mg/0.5 mL, 90 mg/1.0 mL

<sup>†</sup>90 mg/1.0 mL single-use vial is not available in Canada.

**WARNINGS AND PRECAUTIONS**

Your doctor will assess your health before each treatment.

BEFORE you use STELARA<sup>®</sup> talk to your doctor or pharmacist if you:

- ever had an allergic reaction to STELARA<sup>®</sup>. Ask your doctor if you are not sure.
- have any kind of infection even if it is very minor.
- have an infection that won't go away or a history of infection that keeps coming back.
- have had TB (tuberculosis), or if you have recently been near anyone who might have TB.
- have or have had any type of cancer.
- have any new or changing lesions within psoriasis areas or on normal skin.
- have recently received or are scheduled to receive a vaccine. Tell your doctor if anyone in your house needs a vaccine. The viruses in some vaccines can spread to people with a weakened immune system, and can cause serious problems.
- are receiving or have received "allergy shots", especially for serious allergic reactions.
- are pregnant, planning to become pregnant, or breastfeeding.

**Contact your doctor immediately:**

- if you develop signs of a serious allergic reaction such as skin rash, swollen face, lips, mouth, throat, wheezing, dizziness, trouble swallowing or breathing.

- if you develop headache, vision problems, seizures or change in mental status (for example, confusion).

The needle cover on the pre-filled syringe contains dry natural rubber (a form of latex). This may cause allergic reactions in people who are sensitive to latex. Tell your doctor if you have ever had an allergic reaction to latex and developed any allergic reaction to STELARA<sup>®</sup> injection.

STELARA<sup>®</sup> should only be used during a pregnancy if needed. Women who are breastfeeding should talk to their doctor about whether or not to use STELARA<sup>®</sup>.

Tell your doctor about all the medicines you take, including prescription and non-prescription medicines, vitamins, and herbal supplements.

Know the medicines you take. Keep a list of your medicines and show them to your doctor and pharmacist when you get a new medicine.

## INTERACTIONS WITH THIS MEDICATION

STELARA<sup>®</sup> may change the way the body responds to live vaccines.

STELARA<sup>®</sup> may interact with other medications that decrease the activity of the immune system.

If you have questions ask your health care provider.

## PROPER USE OF THIS MEDICATION

- STELARA<sup>®</sup> is given by injection under the skin.
- STELARA<sup>®</sup> is intended for use under the guidance and supervision of your doctor. In children 12 to 17 of age, it is recommended that STELARA<sup>®</sup> be administered by a health care provider. If your doctor determines that it is appropriate, you may be able to administer STELARA<sup>®</sup> to yourself, after proper training in injection technique using the right type of syringe and the amount (volume) to be injected (see the “Instructions for injecting STELARA<sup>®</sup> under the skin yourself”.)

### Usual dose:

Your doctor will determine the right dose of STELARA<sup>®</sup> for you, the amount of each injection and how often you should receive it. Make sure to discuss with your doctor when you will receive injections and to come in for all your scheduled follow-up appointments.

### Overdose:

Call your doctor if you accidentally inject STELARA<sup>®</sup> more frequently than instructed.

In case of drug overdose, contact a health care practitioner, hospital emergency department or regional Poison Control Centre

immediately, even if there are no symptoms.

### Missed Dose:

If you miss a dose and your psoriasis has not recurred, make the next injection as soon as you remember. Do not double up the injection. If you miss a dose and your psoriasis recurs, call your doctor before taking another injection.

## Instructions for injecting STELARA<sup>®</sup> under the skin yourself:

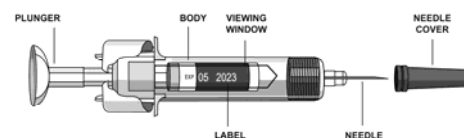
At the start of your therapy, STELARA<sup>®</sup> may be injected by your healthcare provider. In children 12 to 17 years of age, it is recommended that all doses of STELARA<sup>®</sup> be administered by a health care provider. However, your doctor may decide that it is right for you or your caregiver to learn how to inject STELARA<sup>®</sup> under the skin (subcutaneously) yourself. Before you self-inject STELARA<sup>®</sup>, you must be trained by a healthcare professional. If you have not been trained, please contact your healthcare provider to schedule a training session. Call your healthcare provider if you have any questions about giving yourself an injection. STELARA<sup>®</sup> is not to be mixed with other liquids for injection.

## INSTRUCTIONS FOR INJECTING STELARA<sup>®</sup> USING A PRE-FILLED SYRINGE

To reduce the risk of accidental needle sticks to users, each pre-filled syringe is equipped with a needle guard that is automatically activated to cover the needle after complete delivery of the syringe content.

Do not shake STELARA<sup>®</sup> at any time. Prolonged vigorous shaking may damage the product. If the product has been shaken vigorously, don't use it.

### 1: PREPARING FOR PRE-FILLED SYRINGE USE



### Take the Syringe out of the Refrigerator

If your dose amount is 90 mg and you receive two 45 mg packages, you need to give a second injection right after the first. Choose a different site for the second injection. Children who weigh 60 kg or more may use the prefilled syringe.

### Check Expiration Date

Open the box and remove the pre-filled syringe. Check the expiration date on the pre-filled syringe and the label of the box. If the expiration date has passed, don't use it.

**Assemble Additional Supplies**

Assemble the additional supplies you will need for your injection. These include an antiseptic wipe, a cotton ball or gauze, and a sharps container for syringe disposal.

**Check Solution in Syringe**

Hold the pre-filled syringe with the covered needle pointing upward. Make sure the syringe is not damaged. Look at the solution or liquid in the syringe to make sure that it is clear to slightly opalescent and colorless to slightly yellow. DO NOT use if it is frozen, discolored, cloudy or contains particles and contact your healthcare provider for assistance.

**DO NOT** remove the needle cover from the pre-filled syringe.

**DO NOT** pull back on the plunger head at any time.

**2: CHOOSING AND PREPARING THE INJECTION SITE**

**Choose the Injection Site\***

Good sites are the top of the thigh and around the tummy (abdomen) but about 2 inches away from the belly button (navel). Avoid, if possible, skin involved with psoriasis. If your caregiver is giving you the injection, they may use the upper arms or buttocks as well.

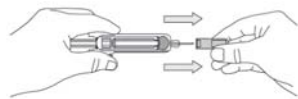


\*Areas in gray are recommended injection sites.

**Prepare the Injection Site**

Thoroughly wash your hands with soap and warm water. Wipe the injection site with an antiseptic wipe. DO NOT touch this area again before giving the injection.

**3: INJECTING THE MEDICATION**



**Remove the Needle Cover**

When you are ready to inject, pick up the pre-filled syringe, hold the body of the syringe with one hand and pull the needle cover straight off. Throw the needle cover into the trash. You may notice a small air bubble in the pre-filled syringe. You do not need to remove the air bubble. You may also see a drop of liquid at the end of the needle – this is normal. Do not touch the needle or allow it to touch any surface.

Note: The needle cover should NOT be removed until you are

ready to inject the dose. Do not use syringe if it is dropped without the needle cover in place. If you drop the syringe without the needle cover in place, please contact your healthcare provider for assistance.

**Inject the Medication**

Gently pinch the cleaned skin between your thumb and index finger. Don't squeeze it.



Push the syringe needle into the pinched skin.

Push the plunger with your thumb as far as it will go to inject all of the liquid.

Push it slowly and evenly, keeping the skin pinched.

When the plunger meets the end of the syringe barrel, and all of the medication has been injected, release the pinched skin and gently remove the needle. Following complete injection, the needle guard will automatically extend over the needle and lock as you take your hand off the plunger.



**4: AFTER THE INJECTION**

**Dispose of the Empty Syringe**

Immediately dispose of the empty syringe into the sharps container. For your safety and health and for the safety of others, needles and syringes **must NEVER** be re-used. Dispose of sharps container according to your local regulations.

**Use a Cotton Ball or Gauze**

There may be a small amount of blood or liquid at the injection site, which is normal. You can press a cotton ball or gauze over the injection site and hold for 10 seconds. Do not rub the injection site. You may cover the injection site with a small adhesive bandage, if necessary.

**INSTRUCTIONS FOR INJECTING STELARA® FROM A VIAL†**

†90 mg/1.0 mL single-use vial is not available in Canada.

Do not shake STELARA® at any time. Prolonged vigorous shaking may damage the product. If the product has been shaken vigorously, don't use it. STELARA® is not to be mixed with other liquids for injection.

## 1: CHECK VIAL(S) AND ASSEMBLE MATERIALS

### Take the Vial(s) out of the Refrigerator

If your dose is 45 mg you will receive one 45 mg vial. If your dose is 90 mg, you will receive either one 90 mg vial or two 45 mg vials. If you receive two 45 mg vials for a 90 mg dose, you will need to give yourself two injections one right after the other. Use a new needle and syringe. Choose a different site for the second injection.

Children weighing less than 60 kg require a dose lower than 45 mg. Make sure you know the proper amount (volume) and type of syringe needed for dosing. If you don't know the amount or type of syringe needed, contact your healthcare provider for further instructions.

### Check Expiration Date

Open the box and remove the vial. Check the expiration date on the vial and the label of the box. If the expiration date has passed, don't use it.

### Check Solution in Vial

Make sure the vial is not damaged. Look at the solution or liquid in the vial to make sure that it is clear to slightly opalescent and colorless to slightly yellow. **DO NOT** use if it is frozen, discolored, cloudy or contains particles and contact your healthcare provider for assistance.

### Assemble Additional Supplies

Assemble the additional supplies you will need for your injection. These include an antiseptic wipe, a cotton ball or gauze, and a sharps container for syringe disposal.



## 2: CHOOSING AND PREPARING THE INJECTION SITE

### Choose the Injection Site\*

Good sites are the top of the thigh and around the tummy (abdomen) but about 2 inches away from the belly button (navel). Avoid, if possible, skin involved with psoriasis. If your caregiver is giving you the injection, they may use the upper arms or buttocks as well.



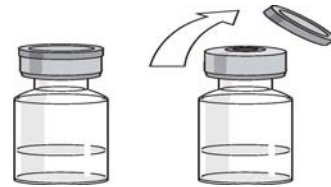
\*Areas in gray are recommended injection sites.

### Prepare the Injection site

Thoroughly wash your hands with soap and warm water. Wipe the injection site with an antiseptic wipe. **DO NOT** touch this area again before giving the injection.

## 3: PREPARING THE DOSE

Remove the cap from the top of the vial but do not remove the stopper. Clean the stopper with an antiseptic wipe.



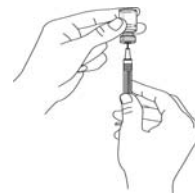
**Remove the needle cover from the syringe. Do not touch the needle or allow the needle to touch anything.**

**Put the vial on a flat surface and push the syringe needle through the rubber stopper.**

### Turn the vial and the syringe upside down.

For adults and children 12 to 17 years of age, who weigh 60 kg or more, pull on the syringe plunger to fill the syringe with the entire amount (volume) of liquid prescribed by your healthcare provider (0.5 mL to 1.0 mL). It is important that the needle is always in the liquid in order to prevent air bubbles from forming in the syringe.

For children 12 to 17 years of age who weigh less than 60 kg, the amount of liquid prescribed by your health care provider may be less than 0.5 mL. Your health care provider will recommend how much liquid is needed.



### Remove the needle from the vial

Hold the syringe with the needle pointing up to see if it has any air bubbles inside. If there are air bubbles tap the side gently until the air bubbles go to the top of the syringe and press the plunger until all of the air (but none of the liquid) has been removed. Do not lay the syringe down or allow the needle to touch anything.



## 4: INJECTING THE MEDICATION

**Gently pinch the cleaned skin** between your thumb and index finger. Don't squeeze it.



**Push the syringe needle into the pinched skin.**

**Push the plunger with your thumb as far as it will go to inject all of the liquid.** Push it slowly and evenly, keeping the skin gently pinched.

**When the plunger is pushed as far as it will go,** take out the needle and let go of the skin.

**Press an antiseptic wipe** over the injection site for a few seconds after the injection.

**Dispose the Empty Syringe and Vial(s)**

Discard any unused portion of STELARA®. Immediately dispose of the empty syringe into the sharps container. For your safety and health and for the safety of others, vials, needles and syringes must NEVER be re-used. Dispose of sharps container according to your local regulations. Empty vials, antiseptic wipes, and other supplies can be placed in your regular trash.

**Use a Cotton Ball or Gauze**

There may be a small amount of blood or liquid at the injection site, which is normal. You can press a cotton ball or gauze over the injection site and hold for 10 seconds. Do not rub the injection site. You may cover the injection site with a small adhesive bandage, if necessary.

**SIDE EFFECTS AND WHAT TO DO ABOUT THEM**

The most common side effects of STELARA® are:

- Upper respiratory tract infections such as the common cold
- Headache

STELARA® is a medicine that may decrease the activity of your immune system. It can increase your chances of getting serious side effects including:

**Serious Infections**

- STELARA® may lower your ability to fight infections. Some infections could become serious and lead to hospitalization. If you have an infection, tell your healthcare provider before you start using STELARA®. If you get an infection, have any sign of an infection such as fever, feel very tired, cough, flu-like symptoms, or have any open cuts or warm, red, or painful sore or sores on your body, tell your healthcare provider right away.
- Your doctor will examine you for tuberculosis (TB) and perform a test to see if you have TB. If your doctor feels that you are at risk for TB, you may be treated with medicine for TB before you begin treatment with STELARA® and during treatment with STELARA®.

**Cancers**

- Many drugs such as STELARA® that may decrease the activity of the immune system, may increase the risk of cancer. Tell your doctor if you notice any unusual changes to your skin or health status while receiving STELARA® treatment.

Serious skin Conditions

Shedding of skin – increase in redness and shedding of skin over a larger area of the body may be symptoms of erythrodermic psoriasis or exfoliative dermatitis, which are serious skin conditions. You should contact your doctor straight away if you notice any of these signs.

**SERIOUS SIDE EFFECTS, HOW OFTEN AND WHAT TO DO ABOUT THEM**

Symptom / effect		Talk with your doctor or pharmacist		Stop taking drug and call your doctor immediately
		Only if severe	In all cases	
Very Common	Upper respiratory tract infections	√		
Common	Sore throat, nasal congestion	√		
	Allergic reaction (skin rash)		√	
Uncommon	Cellulitis (skin infection)		√	
Rare	Serious allergic reactions (e.g.: swollen face or trouble breathing)			√
	Increase in redness and shedding of skin		√	

Very common: at least 1 in 10 patients; Common: at least 1 in 100 and less than 1 in 10 patients; Uncommon: at least 1 in 1,000 and less than 1 in 100 patients; Rare: at least 1 in 10,000 and less than 1 in 1000.

In general, the side effects of STELARA® seen in children 12 to 17 years of age are similar to those in adults.

*This is not a complete list of side effects. For any unexpected effects while taking STELARA®, contact your doctor or pharmacist.*



## HOW TO STORE IT

If you are using STELARA<sup>®</sup> at home, it is important to store the product in your refrigerator although not in the freezer compartment. STELARA<sup>®</sup> should not be frozen. Keep the product in the original carton to protect from light until the time of use.

## REPORTING SUSPECTED SIDE EFFECTS

You can report any suspected adverse reactions associated with the use of health products to the Canada Vigilance Program by one of the following 3 ways:

- Report online at [www.healthcanada.gc.ca/medeffect](http://www.healthcanada.gc.ca/medeffect)
- Call toll-free at 1-866-234-2345
- Complete a Canada Vigilance Reporting Form and:
  - Fax toll-free to 1-866-678-6789, or
  - Mail to: Canada Vigilance Program  
Health Canada  
Postal Locator 0701E  
Ottawa, ON K1A 0K9

Postage paid labels, Canada Vigilance Reporting Form and the adverse reaction reporting guidelines are available on the MedEffect<sup>®</sup> Canada Web site at [www.healthcanada.gc.ca/medeffect](http://www.healthcanada.gc.ca/medeffect).

*NOTE: Should you require information related to the management of side effects, contact your health professional. The Canada Vigilance Program does not provide medical advice.*

## MORE INFORMATION

For questions, concerns, or the full Product Monograph go to [www.janssen.ca](http://www.janssen.ca) or contact the manufacturer, Janssen Inc. at: 1-800-567-3331 or 1-800-387-8781

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Last revised: December 2015