SUMMARY OF PRODUCT CHARACTERISTICS

1 NAME OF THE MEDICINAL PRODUCT

Cimzia 200 mg solution for injection in dose-dispenser cartridge

2 QUALITATIVE AND QUANTITATIVE COMPOSITION

Each dose-dispenser cartridge contains 200 mg certolizumab pegol in one ml.

Certolizumab pegol is a recombinant, humanised antibody Fab' fragment against tumour necrosis factor alpha (TNFα) expressed in *Escherichia coli* and conjugated to polyethylene glycol (PEG).

For the full list of excipients, see section 6.1.

3 PHARMACEUTICAL FORM

Solution for injection (injection).

Clear to opalescent, colourless to yellow solution. The pH of the solution is approximately 4.7.

4 CLINICAL PARTICULARS

4.1 Therapeutic indications

Rheumatoid arthritis

Cimzia, in combination with methotrexate (MTX), is indicated for:

- the treatment of moderate to severe, active rheumatoid arthritis (RA) in adult patients when the response to disease-modifying antirheumatic drugs (DMARDs) including MTX, has been inadequate. Cimzia can be given as monotherapy in case of intolerance to MTX or when continued treatment with MTX is inappropriate

- the treatment of severe, active and progressive RA in adults not previously treated with MTX or other DMARDs.

Cimzia has been shown to reduce the rate of progression of joint damage as measured by
X-ray and to improve physical function, when given in combination with MTX.

Axial spondyloarthritis

Cimzia is indicated for the treatment of adult patients with severe active axial spondyloarthritis, comprising:

Ankylosing spondylitis (AS) (also known as radiographic axial spondyloarthritis)

Adults with severe active ankylosing spondylitis who have had an inadequate response to, or are intolerant to nonsteroidal anti-inflammatory drugs (NSAIDs).

Axial spondyloarthritis without radiographic evidence of AS (also known as non-radiographic axial spondyloarthritis)

Adults with severe active axial spondyloarthritis without radiographic evidence of AS but with objective signs of inflammation by elevated C-reactive protein (CRP) and /or magnetic resonance imaging (MRI), who have had an inadequate response to, or are intolerant to NSAIDs.

Psoriatic arthritis

Cimzia, in combination with MTX, is indicated for the treatment of active psoriatic arthritis in adults when the response to previous DMARD therapy has been inadequate.

Cimzia can be given as monotherapy in case of intolerance to methotrexate or when continued treatment with methotrexate is inappropriate.

Plaque psoriasis

Cimzia is indicated for the treatment of moderate to severe plaque psoriasis in adults who are candidates for systemic therapy.

For details on therapeutic effects, see section 5.1.

4.2 Posology and method of administration

Treatment should be initiated and supervised by specialist physicians experienced in the diagnosis and treatment of conditions for which Cimzia is indicated. Patients should be given the special reminder card.

Posology

Rheumatoid arthritis, psoriatic arthritis, axial spondyloarthritis, plaque psoriasis

Loading dose
The recommended starting dose of Cimzia for adult patients is 400 mg (given as 2 subcutaneous injections of 200 mg each) at weeks 0, 2 and 4. For rheumatoid arthritis and psoriatic arthritis, MTX should be continued during treatment with Cimzia where appropriate.

Maintenance dose
Rheumatoid arthritis
After the starting dose, the recommended maintenance dose of Cimzia for adult patients with rheumatoid arthritis is 200 mg every 2 weeks. Once clinical response is confirmed, an alternative maintenance dosing of 400 mg every 4 weeks can be considered. MTX should be continued during treatment with Cimzia where appropriate.

Axial spondyloarthritis
After the starting dose, the recommended maintenance dose of Cimzia for adult patients with axial spondyloarthritis is 200 mg every 2 weeks or 400 mg every 4 weeks. After at least 1 year of treatment with Cimzia, in patients with sustained remission, a reduced maintenance dose of 200 mg every 4 weeks may be considered (see section 5.1).

Psoriatic arthritis
After the starting dose, the recommended maintenance dose of Cimzia for adult patients with psoriatic arthritis is 200 mg every 2 weeks. Once clinical response is confirmed, an alternative maintenance dosing of 400 mg every 4 weeks can be considered. MTX should be continued during treatment with Cimzia where appropriate.

For the above indications, available data suggest that clinical response is usually achieved within 12 weeks of treatment. Continued therapy should be carefully reconsidered in patients who show no evidence of therapeutic benefit within the first 12 weeks of treatment.

Plaque psoriasis
After the starting dose, the maintenance dose of Cimzia for adult patients with plaque psoriasis is 200 mg every 2 weeks. A dose of 400 mg every 2 weeks can be considered in patients with insufficient response (see section 5.1).

Available data in adults with plaque psoriasis suggest that a clinical response is usually achieved within 16 weeks of treatment. Continued therapy should be carefully reconsidered in patients who show no evidence of therapeutic benefit within the first 16 weeks of treatment. Some patients with an initial partial response may subsequently improve with continued treatment beyond 16 weeks.

Missed dose
Patients who miss a dose should be advised to inject the next dose of Cimzia as soon as they remember and then continue injecting subsequent doses as instructed.

Special populations
Paediatric population (< 18 years old)
The safety and efficacy of Cimzia in children and adolescents below age 18 years have not yet been established. No data are available.

Elderly patients (≥ 65 years old)
No dose adjustment is required. Population pharmacokinetic analyses showed no effect of age (see section 5.2).

Renal and hepatic impairment
Cimzia has not been studied in these patient populations. No dose recommendations can be made (see section 5.2).

Method of administration
The total content (1 ml) of the dose-dispenser cartridge should be administered using the electromechanical injection device ava for a subcutaneous injection only. Suitable sites for injection would include the thigh or abdomen.

Cimzia solution for injection in a dose-dispenser cartridge is intended for single-use in conjunction with the electromechanical injection device named ava. After proper training in the injection technique, patients may self-inject using the electromechanical injection device ava with the single-use dose-dispenser cartridge if their physician determines that it is appropriate and with medical follow-up as necessary. The physician should discuss with the patient which injection presentation option is the most appropriate.

The initial version of the ava injection device does not support administration of a maintenance dose of 400 mg every 2 weeks (plaque psoriasis) or a reduced maintenance dose of 200 mg every 4 weeks (axial spondyloarthritis); for patients receiving these maintenance doses, the physician is advised to use the ava Connect version of the ava injection device, or other presentations.

For administration, the instructions for use at the end of the package leaflet and in the user manual provided with the electromechanical injection device ava should be followed.

4.3 Contraindications

Hypersensitivity to the active substance or to any of the excipients listed in section 6.1.

Active tuberculosis or other severe infections such as sepsis or opportunistic infections (see section 4.4).

Moderate to severe heart failure (NYHA classes III/IV) (see section 4.4).

4.4 Special warnings and precautions for use

Traceability

In order to improve the traceability of biological medicinal products, the name and the batch number of the administered product should be clearly recorded.

Infections

Patients must be monitored closely for signs and symptoms of infections including tuberculosis before, during and after treatment with Cimzia. Because the elimination of certolizumab pegol may take up to 5 months, monitoring should be continued throughout this period (see section 4.3).

Treatment with Cimzia must not be initiated in patients with a clinically important active infection, including chronic or localised infections, until the infection is controlled (see section 4.3).

Patients who develop a new infection while undergoing treatment with Cimzia should be monitored closely. Administration of Cimzia should be discontinued if a patient develops a new serious infection until the infection is controlled. Physicians should exercise caution when considering the use of Cimzia in patients with a history of recurring or opportunistic infection or with underlying conditions which may predispose patients to infections, including the use of concomitant immunosuppressive medications.

Patients with rheumatoid arthritis may not manifest typical symptoms of infection, including fever, due to their disease and concomitant medicinal products. Therefore, early detection of any infection, particularly atypical clinical presentations of a serious infection, is critical to minimise delays in diagnosis and initiation of treatment.

Serious infections, including sepsis and tuberculosis (including miliary, disseminated and extrapulmonary disease), and opportunistic infections (e.g. histoplasmosis, nocardia, candidiasis) have been reported in patients receiving Cimzia. Some of these events have been fatal.

Tuberculosis

Before initiation of therapy with Cimzia, all patients must be evaluated for both active or inactive (latent) tuberculosis infection. This evaluation should include a detailed medical history for patients with a personal history of tuberculosis, with possible previous exposure to others with active tuberculosis, and with previous and/or current use of immunosuppressive therapy. Appropriate screening tests, e.g. tuberculin skin test and chest X-ray, should be performed in all patients (local recommendations may apply). It is recommended that the conduct of these tests should be recorded in the patient's reminder card. Prescribers are reminded of the risk of false negative tuberculin skin test results, especially in patients who are severely ill or immunocompromised.

If active tuberculosis is diagnosed prior to or during treatment, Cimzia therapy must not be initiated and must be discontinued (see section 4.3).

If inactive (‘latent’) tuberculosis is suspected, a physician with expertise in the treatment of tuberculosis should be consulted. In all situations described below, the benefit/risk balance of Cimzia therapy should be very carefully considered.

If latent tuberculosis is diagnosed, appropriate anti-tuberculosis therapy must be started before initiating treatment with Cimzia and in accordance with local recommendations.

Use of anti-tuberculosis therapy should also be considered before the initiation of Cimzia in patients with a past history of latent or active tuberculosis in whom an adequate course of treatment cannot be confirmed, and in patients who have significant risk factors for tuberculosis despite a negative test for latent tuberculosis. Biological tests for tuberculosis screening should be considered before starting Cimzia treatment if there is any potential latent tuberculosis infection, regardless of BCG vaccination.

Despite previous or concomitant prophylactic treatment for tuberculosis, cases of active tuberculosis have occurred in patients treated with TNF-antagonists including Cimzia. Some patients who have been successfully treated for active tuberculosis have redeveloped tuberculosis while being treated with Cimzia.

Patients should be instructed to seek medical advice if signs/symptoms (e.g. persistent cough, wasting/weight loss, low grade fever, listlessness) suggestive of a tuberculosis infection occur during or after therapy with Cimzia.

Hepatitis B virus (HBV) reactivation

Reactivation of hepatitis B has occurred in patients receiving a TNF-antagonist including certolizumab pegol, who are chronic carriers of this virus (i.e., surface antigen positive). Some cases have had a fatal outcome.

Patients should be tested for HBV infection before initiating treatment with Cimzia. For patients who test positive for HBV infection, consultation with a physician with expertise in the treatment of hepatitis B is recommended.

Carriers of HBV who require treatment with Cimzia should be closely monitored for signs and symptoms of active HBV infection throughout therapy and for several months following termination of therapy. Adequate data of treating patients who are carriers of HBV with anti-viral therapy in conjunction with TNF-antagonist therapy to prevent HBV reactivation are not available. In patients who develop HBV reactivation, Cimzia should be stopped and effective anti-viral therapy with appropriate supportive treatment should be initiated.

Malignancies and lymphoproliferative disorders

The potential role of TNF-antagonist therapy in the development of malignancies is not known. Caution should be exercised when considering TNF-antagonist therapy for patients with a history of malignancy or when considering continuing treatment in patients who develop malignancy.

With the current knowledge, a possible risk for the development of lymphomas, leukaemia or other malignancies in patients treated with a TNF-antagonist cannot be excluded.

In clinical trials with Cimzia and other TNF-antagonists, more cases of lymphoma and other malignancies have been reported among patients receiving TNF-antagonists than in control patients receiving placebo (see section 4.8). In the post marketing setting, cases of leukaemia have been reported in patients treated with a TNF-antagonist. There is an increased background risk for lymphoma and leukaemia in rheumatoid arthritis patients with long-standing, highly active, inflammatory disease, which complicates the risk estimation.

No trials have been conducted that include patients with a history of malignancy, or that continue treatment in patients who develop malignancy, while receiving Cimzia.

Skin cancers

Melanoma and Merkel cell carcinoma have been reported in patients treated with TNF-antagonists including certolizumab pegol (see section 4.8). Periodic skin examination is recommended, particularly for patients with risk factors for skin cancer.

Paediatric malignancy

Malignancies, some fatal, have been reported among children, adolescents and young adults (up to 22 years of age) treated with TNF-antagonists (initiation of therapy $\leq$ 18 years of age) in the post marketing setting. Approximately half the cases were lymphomas. The other cases represented a variety of different malignancies and included rare malignancies usually associated with immunosuppression. A risk for the development of malignancies in children and adolescents treated with TNF-antagonists cannot be excluded.

Post-marketing cases of hepatosplenic T-cell lymphoma (HSTCL), have been reported in patients treated with TNF-antagonists. This rare type of T-cell lymphoma has a very aggressive disease course and is usually fatal. The majority of reported TNF-antagonist cases occurred in adolescent and young adult males with Crohn's disease or ulcerative colitis. Almost all of these patients had received treatment with the immunosuppressants azathioprine and/or 6-mercaptopurine concomitantly with a TNF-antagonist at or prior to diagnosis. A risk for development of hepatosplenic T-cell lymphoma in patients treated with Cimzia cannot be excluded.

Chronic obstructive pulmonary disease (COPD)

In an exploratory clinical trial evaluating the use of another TNF-antagonist, infliximab, in patients with moderate to severe chronic obstructive pulmonary disease (COPD), more malignancies, mostly in the lung or head and neck, were reported in infliximab-treated patients compared with control patients. All patients had a history of heavy smoking. Therefore, caution should be exercised when using any TNF-antagonist in COPD patients, as well as in patients with increased risk for malignancy due to heavy smoking.

Congestive heart failure

Cimzia is contraindicated in moderate or severe heart failure (see section 4.3). In a clinical trial with another TNF-antagonist, worsening congestive heart failure and increased mortality due to congestive heart failure have been observed. Cases of congestive heart failure have also been reported in rheumatoid arthritis patients receiving Cimzia. Cimzia should be used with caution in patients with mild heart failure (NYHA class I/II). Treatment with Cimzia must be discontinued in patients who develop new or worsening symptoms of congestive heart failure.

Haematological reactions

Reports of pancytopaenia, including aplastic anaemia, have been rare with TNF-antagonists. Adverse reactions of the haematologic system, including medically significant cytopaenia (e.g. leukopaenia, pancytopaenia, thrombocytopaenia) have been reported with Cimzia (see section 4.8). All patients should be advised to seek immediate medical attention if they develop signs and symptoms suggestive of blood dyscrasias or infection (e.g., persistent fever, bruising, bleeding, pallor) while on Cimzia. Discontinuation of Cimzia therapy should be considered in patients with confirmed significant haematological abnormalities.

Neurological events

Use of TNF-antagonists has been associated with rare cases of new onset or exacerbation of clinical symptoms and/or radiographic evidence of demyelinating disease, including multiple sclerosis. In patients with pre-existing or recent onset of demyelinating disorders, the benefits and risks of TNF-antagonist treatment should be carefully considered before initiation of Cimzia therapy. Rare cases of neurological disorders, including seizure disorder, neuritis and peripheral neuropathy, have been reported in patients treated with Cimzia.

Hypersensitivity

Severe hypersensitivity reactions have been reported rarely following Cimzia administration. Some of these reactions occurred after the first administration of Cimzia. If severe reactions occur, administration of Cimzia should be discontinued immediately and appropriate therapy instituted.

There are limited data on the use of Cimzia in patients who have experienced a severe hypersensitivity reaction towards another TNF-antagonist; in these patients caution is needed.

Latex-sensitivity

The needle shield inside the removable cap of the CIMZIA dose-dispenser cartridge contains a derivative of natural rubber latex (see section 6.5). Contact with natural rubber latex may cause severe allergic reactions in individuals sensitive to latex. No antigenic latex protein has to date been detected in the removable needle cap of the Cimzia dose-dispenser cartridge. Nevertheless, a potential risk of hypersensitivity reactions cannot be completely excluded in latex-sensitive individuals.

Immunosuppression

Since tumour necrosis factor (TNF) mediates inflammation and modulates cellular immune responses, the possibility exists for TNF-antagonists, including Cimzia, to cause immunosupression, affecting host defences against infections and malignancies.

Autoimmunity

Treatment with Cimzia may result in the formation of antinuclear antibodies (ANA) and, uncommonly, in the development of a lupus-like syndrome (see section 4.8). The impact of long-term treatment with Cimzia on the development of autoimmune diseases is unknown. If a patient develops symptoms suggestive of a lupus-like syndrome following treatment with Cimzia, treatment must be discontinued. Cimzia has not been studied specifically in a lupus population (see section 4.8).

Vaccinations

Patients treated with Cimzia may receive vaccinations, except for live vaccines. No data are available on the response to live vaccinations or the secondary transmission of infection by live vaccines in patients receiving Cimzia. Live vaccines should not be administered concurrently with Cimzia.

In a placebo-controlled clinical trial in patients with rheumatoid arthritis, similar antibody response between Cimzia and placebo treatment were observed when the pneumococcal polysaccharide vaccine and influenza vaccine were administered concurrently with Cimzia. Patients receiving Cimzia and concomitant methotrexate had a lower humoral response compared with patients receiving Cimzia alone. The clinical significance of this is unknown.

Concomitant use with other biologics

Severe infections and neutropaenia were reported in clinical trials with concurrent use of anakinra (an interleukin-1 antagonist) or abatacept (a CD28 modulator) and

another TNF-antagonist, etanercept, with no added benefit compared to TNF-antagonist therapy alone. Because of the nature of the adverse events seen with the combination of another TNF-antagonist with either abatacept or anakinra therapy, similar toxicities may also result from the combination of anakinra or abatacept and other TNF-antagonists. Therefore the use of certolizumab pegol in combination with anakinra or abatacept is not recommended (see section 4.5).

Surgery

There is limited safety experience with surgical procedures in patients treated with Cimzia. The 14-day half-life of certolizumab pegol should be taken into consideration if a surgical procedure is planned. A patient who requires surgery while on Cimzia should be closely monitored for infections, and appropriate actions should be taken.

Activated partial thromboplastin time (aPTT) assay

Interference with certain coagulation assays has been detected in patients treated with Cimzia. Cimzia may cause erroneously elevated aPTT assay results in patients without coagulation abnormalities. This effect has been observed with the PTT-Lupus Anticoagulant (LA) test and Standard Target Activated Partial Thromboplastin time (STA-PTT) Automate tests from Diagnostica Stago, and the HemosIL APTT-SP liquid and HemosIL lyophilised silica tests from Instrumentation Laboratories. Other aPTT assays may be affected as well. There is no evidence that Cimzia therapy has an effect on coagulation *in vivo*. After patients receive Cimzia, careful attention should be given to interpretation of abnormal coagulation results. Interference with thrombin time (TT) and prothrombin time (PT) assays have not been observed.

Elderly patients

In the clinical trials, there was an apparently higher incidence of infections among subjects ≥ 65 years of age, compared to younger subjects, although experience is limited. Caution should be exercised when treating the elderly patients, and particular attention paid with respect to occurrence of infections.

4.5 Interaction with other medicinal products and other forms of interaction

Concomitant treatment with methotrexate, corticosteroids, nonsteroidal anti-inflammatory drugs (NSAIDs) and analgesics showed no effect on the pharmacokinetics of certolizumab pegol based on a population pharmacokinetics analysis.

The combination of certolizumab pegol and anakinra or abatacept is not recommended (see section 4.4).

Co-administration of Cimzia with methotrexate had no significant effect on the pharmacokinetics of methotrexate. In study-to-study comparison, the

pharmacokinetics of certolizumab pegol appeared similar to those observed previously in healthy subjects.

4.6 Fertility, pregnancy and lactation

Women of childbearing potential

The use of adequate contraception should be considered for women of childbearing potential. For women planning pregnancy, the clinical need for ongoing Cimzia treatment should be evaluated. If the decision is made to clear Cimzia from the body prior to conception, contraception should be continued for 5 months after the last Cimzia dose (see section 5.2).

Pregnancy

Human data
A large amount of data (more than 1500 pregnancies exposed to Cimzia during the first trimester) from prospectively reported pregnancies with known pregnancy outcomes indicate no malformative nor feto/neonatal toxicity. Continuous data collection is ongoing with pharmacovigilance cases reporting and a pregnancy registry.

In a pregnancy register (the OTIS study) the proportion of major birth defects in live-born infants was 15/132 (11.4%) in women treated with Cimzia at least during the first trimester, and 8/126 (6.3%) in women with the same indicated diseases but not treated with Cimzia (relative risk 1.85; 95% CI 0.74 to 4.60). A similar association was seen when women treated with Cimzia were compared with women not having a disease consistent with approved Cimzia indications (proportion 10/126 [7.9%] and relative risk 1.65; 95% CI 0.75 to 3.64). No pattern of major or minor defects was identified.
There were no distinct differences between the Cimzia treated group and both comparison groups for spontaneous abortion, serious or opportunistic infections, hospitalization, adverse vaccine reactions, in the children who were followed up for up to 5 years of age. No stillbirths or termination were reported in the Cimzia arm while 2 stillbirths and 3 pregnancy terminations were reported in the disease unexposed arm. The interpretation of data may be impacted due to methodological limitations of the study, including small sample size and non-randomized design.

In a clinical study of 21 women receiving Cimzia during pregnancy, certolizumab pegol plasma concentrations were within the range of concentrations observed in non-pregnant adult patients (see section 5.2

In a clinical study 16 women were treated with certolizumab pegol (200 mg every 2 weeks or 400 mg every 4 weeks) during pregnancy. Certolizumab pegol plasma concentrations measured in 14 infants at birth were Below the Limit of

Quantification (BLQ) in 13 samples; one was 0.042 µg/ml with an infant/mother plasma ratio at birth of 0.09%. At Week 4 and Week 8, all infant concentrations were BLQ. The clinical significance of low levels certolizumab pegol for infants is unknown. It is recommended to wait a minimum of 5 months following the mother's last Cimzia administration during pregnancy before administration of live or live-attenuated vaccines (e.g. BCG vaccine), unless the benefit of the vaccination clearly outweighs the theoretical risk of administration of live or live-attenuated vaccines to the infants.

Animal data
Animal studies using a rodent anti-rat TNFα did not reveal evidence of impaired fertility or harm to the foetus. However, these are insufficient with respect to human reproductive toxicity (see section 5.3). Due to its inhibition of TNFα, Cimzia administered during pregnancy could affect normal immune response in the newborn.

Non-clinical studies suggest low or negligible level of placental transfer of a homologue Fab-fragment of certolizumab pegol (no Fc region) (see section 5.3).

Cimzia should only be used during pregnancy if clinically needed. No dose adjustment is needed.

Breastfeeding
Cimzia can be used during breastfeeding.

In a clinical study in 17 lactating women treated with Cimzia, minimal transfer of certolizumab pegol from the plasma to breast milk was observed. The percentage of the maternal certolizumab pegol dose reaching an infant during a 24 hour period was estimated to 0.04% to 0.30 %. In addition, since certolizumab pegol is a protein that is degraded in the gastrointestinal tract after oral administration, the absolute bioavailability is expected to be very low in a breastfed infant.

Fertility
Effects on sperm motility measures and a trend of reduced sperm count in male rodents have been observed with no apparent effect on fertility (see section 5.3).

In a clinical trial to assess the effect of certolizumab pegol on semen quality parameters, 20 healthy male subjects were randomized to receive a single subcutaneous dose of 400 mg of certolizumab pegol or placebo. During the 14-week follow-up, no treatment effects of certolizumab pegol were seen on semen quality parameters compared to placebo.

4.7 Effects on ability to drive and use machines

Cimzia may have a minor influence on the ability to drive and use machines. Dizziness (including vertigo, vision disorder and fatigue) may occur following administration of Cimzia (see section 4.8).

4.8 Undesirable effects

Summary of the safety profile

Rheumatoid arthritis
Cimzia was studied in 4,049 patients with rheumatoid arthritis in controlled and open label trials for up to 92 months.

In the placebo-controlled studies, patients receiving Cimzia had an approximately 4 times greater duration of exposure compared with the placebo group. This difference in exposure is primarily due to patients on placebo being more likely to withdraw early. In addition, Studies RA-I and RA-II had a mandatory withdrawal for non-responders at Week 16, the majority of whom were on placebo.

The proportion of patients who discontinued treatment due to adverse events during the controlled trials was 4.4% for patients treated with Cimzia and 2.7% for patients treated with placebo.

The most common adverse reactions belonged to the system organ classes Infections and infestations, reported in 14.4% of patients on Cimzia and 8.0% of patients on placebo, General disorders and administration site conditions, reported in 8.8% of patients on Cimzia and 7.4% of patients on placebo, and Skin and subcutaneous tissue disorders, reported in 7.0% of patients on Cimzia and 2.4% of patients on placebo.

Axial spondyloarthritis
Cimzia was initially studied in 325 patients with active axial spondyloarthritis (including ankylosing spondylitis and non-radiographic axial spondyloarthritis) in the AS001 clinical study for up to 4 years, which includes a 24-week placebo-controlled phase followed by a 24-week dose-blind period and a 156-week open-label treatment period. Cimzia was subsequently studied in 317 patients with non-radiographic axial spondyloarthritis in a placebo-controlled study for 52 weeks (AS0006). Cimzia was also studied in patients with axial spondyloarthritis (including ankylosing spondylitis and non-radiographic axial spondyloarthritis) in a clinical study for up to 96 weeks, which included a 48-week open-label run-in phase (N=736) followed by a 48-week placebo-controlled phase (N=313) for patients in sustained remission (C-OPTIMISE). Cimzia was also studied in a 96-week open-label study in 89 axSpA patients with a history of documented anterior uveitis flares. In all 4 studies, the safety profile for these patients was consistent with the safety profile in rheumatoid arthritis and previous experience with Cimzia.

Psoriatic arthritis
Cimzia was studied in 409 patients with psoriatic arthritis in the PsA001 clinical study for up to 4 years which includes a 24-week placebo-

controlled phase followed by a 24-week dose-blind period and a 168-week open-label treatment period. The safety profile for psoriatic arthritis patients treated with Cimzia was consistent with the safety profile in rheumatoid arthritis and previous experience with Cimzia.

Plaque psoriasis
Cimzia was studied in 1112 patients with psoriasis in controlled and open-label studies for up to 3 years. In the Phase III program, the initial and maintenance periods were followed by a 96-week open-label treatment period (see section 5.1). The long-term safety profile of Cimzia 400 mg every 2 weeks and Cimzia 200 mg every 2 weeks was generally similar and consistent with previous experience with Cimzia.

During controlled clinical trials through Week 16, the proportion of patients with serious adverse events was 3.5% for Cimzia and 3.7% for placebo.
The proportion of patients who discontinued treatment due to adverse events in the controlled clinical studies was 1.5% for patients treated with Cimzia and 1.4% for patients treated with placebo.

The most common adverse reactions reported through Week 16 belonged to the system organ classes Infections and infestations, reported in 6.1% of patients on Cimzia and 7% of patients on placebo, General disorders and administration site conditions, reported in 4.1% of patients on Cimzia and 2.3% of patients on placebo, and Skin and subcutaneous tissue disorders, reported in 3.5% of patients on Cimzia and 2.8% of patients on placebo.

Tabulated list of adverse reactions
Adverse reactions based primarily on experience from the placebo-controlled clinical trials and postmarketing cases at least possibly related to Cimzia are listed in Table 1 below, according to frequency and system organ class. Frequency categories are defined as follows: Very common (≥ 1/10); Common (≥ 1/100 to < 1/10); Uncommon (≥ 1/1000 to < 1/100); Rare (≥ 1/10,000 to < 1/1000); Very rare (< 1/10,000), not known (cannot be estimated from the available data). Within each frequency grouping, undesirable effects are presented in order of decreasing seriousness.

Table 1 Adverse reactions in clinical trials and postmarketing

System Organ Class	Frequency	Adverse reactions
Infections and infestations	Common	bacterial infections (including abscess), viral infections (including herpes zoster, papillomavirus, influenza)
	Uncommon	sepsis (including multi-organ failure, septic shock), tuberculosis (including miliary, disseminated and extrapulmonary disease), fungal infections (includes opportunistic)
Neoplasms benign, malignant and unspecified (including cysts and polyps)	Uncommon	blood and lymphatic system malignancies (including lymphoma and leukaemia), solid organ tumours, non-melanoma skin cancers, pre-cancerous lesions (including oral leukoplakia, melanocytic nevus), benign tumours and cysts (including skin papilloma)
	Rare	gastrointestinal tumours, melanoma

System Organ Class	Frequency	Adverse reactions
	Not known	Merkel cell carcinoma*, Kaposi's sarcoma
Blood and the lymphatic system disorders	Common	eosinophilic disorders, leukopaenia (including neutropaenia, lymphopaenia)
	Uncommon	anaemia, lymphadenopathy, thrombocytopaenia, thrombocytosis
	Rare	pancytopaenia, splenomegaly, erythrocytosis, white blood cell morphology abnormal
Immune system disorders	Uncommon	vasculitides, lupus erythematosus, drug hypersensitivity (including anaphylactic shock), allergic disorders, auto-antibody positive
	Rare	angioneurotic oedema, sarcoidosis, serum sickness, panniculitis (including erythema nodosum), worsening of symptoms of dermatomyositis**
Endocrine disorders	Rare	thyroid disorders
Metabolism and nutrition disorders	Uncommon	electrolyte imbalance, dyslipidaemia, appetite disorders, weight change
	Rare	haemosiderosis
Psychiatric disorders	Uncommon	anxiety and mood disorders (including associated symptoms)
	Rare	suicide attempt, delirium, mental impairment
Nervous system disorders	Common	headaches (including migraine), sensory abnormalities
	Uncommon	peripheral neuropathies, dizziness, tremor
	Rare	seizure, cranial nerve inflammation, impaired coordination or balance
	Not known	multiple sclerosis*, Guillain-Barré syndrome*
Eye disorders	Uncommon	visual disorder (including decreased vision), eye and eyelid inflammation, lacrimation disorder
Ear and labyrinth disorders	Uncommon	tinnitus, vertigo
Cardiac disorders	Uncommon	cardiomyopathies (including heart failure), ischaemic coronary artery disorders, arrhythmias (including atrial fibrillation), palpitations
	Rare	pericarditis, atrioventricular block
Vascular disorders	Common	hypertension
	Uncommon	haemorrhage or bleeding (any site), hypercoagulation (including thrombophlebitis, pulmonary embolism), syncope, oedema (including peripheral, facial), ecchymoses (including haematoma, petechiae)
	Rare	cerebrovascular accident, arteriosclerosis, Raynaud's phenomenon, livedo reticularis, telangiectasia
Respiratory, thoracic and mediastinal disorders	Uncommon	asthma and related symptoms, pleural effusion and symptoms, respiratory tract congestion and inflammation, cough
	Rare	interstitial lung disease, pneumonitis

System Organ Class	Frequency	Adverse reactions
Gastrointestinal disorders	Common	nausea
	Uncommon	ascites, gastrointestinal ulceration and perforation, gastrointestinal tract inflammation (any site), stomatitis, dyspepsia, abdominal distension, oropharyngeal dryness
	Rare	odynophagia, hypermotility
Hepatobiliary disorders	Common	hepatitis (including hepatic enzyme increased)
	Uncommon	hepatopathy (including cirrhosis), cholestasis, blood bilirubin increased
	Rare	cholelithiasis
Skin and subcutaneous tissue disorders	Common	rash
	Uncommon	alopecia, new onset or worsening of psoriasis (including palmoplantar pustular psoriasis) and related conditions, dermatitis and eczema, sweat gland disorder, skin ulcer, photosensitivity, acne, skin discolouration, dry skin, nail and nail bed disorders
	Rare	skin exfoliation and desquamation, bullous conditions, hair texture disorder, Stevens-Johnson syndrome**, erythema multiforme**, lichenoid reactions
Musculoskeletal, connective tissue and bone disorders	Uncommon	muscle disorders, blood creatine phosphokinase increased
Renal and urinary disorders	Uncommon	renal impairment, blood in urine, bladder and urethral symptoms
	Rare	nephropathy (including nephritis)
Reproductive system and breast disorders	Uncommon	menstrual cycle and uterine bleeding disorders (including amenorrhea), breast disorders
	Rare	sexual dysfunction
General disorders and administration site conditions	Common	pyrexia, pain (any site), asthaenia, pruritus (any site), injection site reactions
	Uncommon	chills, influenza-like illness, altered temperature perception, night sweats, flushing
	Rare	fistula (any site)
Investigations	Uncommon	blood alkaline phosphatase increased, coagulation time prolonged
	Rare	blood uric acid increased
Injury, poisoning and procedural complications	Uncommon	skin injuries, impaired healing

*These events have been related to the class of TNF-antagonists, but incidence with certolizumab pegol is not known.
**These events have been related to the class of TNF-antagonists.

The additional following adverse reactions have been observed uncommonly with Cimzia in other indications: gastrointestinal stenosis and obstructions, general physical health deterioration, abortion spontaneous and azoospermia.

Description of selected adverse reactions

Infections
The incidence rate of new cases of infections in placebo-controlled clinical trials in rheumatoid arthritis was 1.03 per patient-year for all Cimzia-treated patients and 0.92 per patient-year for placebo-treated patients. The infections consisted primarily of upper respiratory tract infections, urinary tract infections, and lower respiratory tract infections and herpes viral infections (see sections 4.3 and 4.4).

In the placebo-controlled clinical trials in rheumatoid arthritis, there were more new cases of serious infection in the Cimzia treatment groups (0.07 per patient-year; all doses), compared with placebo (0.02 per patient-year). The most frequent serious infections included pneumonia, tuberculosis infections. Serious infections also included invasive opportunistic infections (e.g. pneumocystosis, fungal oesophagitis, nocardiosis and herpes zoster disseminated). There is no evidence of an increased risk of infections with continued exposure over time (see section 4.4).

The incidence rate of new cases of infections in placebo-controlled clinical trials in psoriasis was 1.37 per patient-year for all Cimzia-treated patients and 1.59 per patient-year for placebo-treated patients. The infections consisted primarily of upper respiratory tract infections and viral infections (including herpes infections). The incidence of serious infections was 0.02 per patient-year in Cimzia treated patients. No serious infections were reported in the placebo-treated patients. There is no evidence of an increased risk of infections with continued exposure over time.

Malignancies and lymphoproliferative disorders
Excluding non-melanoma of the skin, 121 malignancies including 5 cases of lymphoma were observed in the Cimzia RA clinical trials in which a total of 4,049 patients were treated, representing 9,277 patient-years. Cases of lymphoma occurred at an incidence rate of 0.05 per 100 patient-years and melanoma at an incidence rate of 0.08 per 100 patient-years with Cimzia in rheumatoid arthritis clinical trials (see section 4.4). One case of lymphoma was also observed in the Phase III psoriatic arthritis clinical trial.

Excluding non-melanoma skin cancer, 11 malignancies including 1 case of lymphoma were observed in the Cimzia psoriasis clinical trials in which a total of 1112 patients were treated, representing 2300 patient-years.

Autoimmunity
In the rheumatoid arthritis pivotal studies, for subjects who were ANA negative at baseline, 16.7% of those treated with Cimzia developed positive ANA titers, compared with 12.0% of subjects in the placebo group. For subjects who were anti-dsDNA antibody negative at baseline, 2.2% of those treated with Cimzia developed positive anti-dsDNA antibody titers, compared with 1.0% of subjects in the placebo group. In both placebo-controlled and open-label follow-up clinical trials for rheumatoid arthritis, cases of lupus-like

syndrome were reported uncommonly. There have been rare reports of other immune-mediated conditions; the causal relationship to Cimzia is not known. The impact of long-term treatment with Cimzia on the development of autoimmune diseases is unknown.

Injection site reactions
In the placebo-controlled rheumatoid arthritis clinical trials, 5.8% of patients treated with Cimzia developed injection site reactions such as erythema, itching, haematoma, pain, swelling or bruising, compared to 4.8% of patients receiving placebo. Injection site pain was observed in 1.5% of patients treated with Cimzia with no cases leading to withdrawal.

Creatine phosphokinase elevations
The frequency of creatine phosphokinase (CPK) elevations was generally higher in patients with axSpA as compared to the RA population. The frequency was increased both in patients treated with placebo (2.8% vs 0.4% in axSpA and RA populations, respectively) as well as in patients treated with Cimzia (4.7% vs 0.8% in axSpA and RA populations, respectively). The CPK elevations in the axSpA study were mostly mild to moderate, transient in nature and of unknown clinical significance with no cases leading to withdrawal.

Reporting of suspected adverse reactions
Reporting suspected adverse reactions after authorisation of the medicinal product is important. It allows continued monitoring of the benefit/risk balance of the medicinal product. Healthcare professionals are asked to report any suspected adverse reactions via:

Yellow Card Scheme
Website: www.mhra.gov.uk/yellowcard or search for MHRA Yellow Card in the Google Play or Apple App Store.

4.9 Overdose

No dose-limiting toxicity was observed during clinical trials. Multiple doses of up to 800 mg subcutaneously and 20 mg/kg intravenously have been administered. In cases of overdose, it is recommended that patients are monitored closely for any adverse reactions or effect, and appropriate symptomatic treatment initiated immediately.

5. PHARMACOLOGICAL PROPERTIES

5.1 Pharmacodynamic properties

Pharmacotherapeutic group: immunosuppressants, tumour necrosis factor alpha (TNFα) inhibitors, ATC code: L04AB05

Mechanism of action

Cimzia has a high affinity for human TNFα and binds with a dissociation constant (KD) of 90 pM. TNFα is a key pro-inflammatory cytokine with a central role in inflammatory processes. Cimzia selectively neutralises TNFα (IC90 of 4 ng/ml for inhibition of human TNFα in the *in vitro* L929 murine fibrosarcoma cytotoxicity assay) but does not neutralise lymphotoxin α (TNFβ).

Cimzia was shown to neutralise membrane associated and soluble human TNFα in a dose-dependent manner. Incubation of monocytes with Cimzia resulted in a dose-dependent inhibition of lipopolysaccharide (LPS)-induced TNFα and IL1β production in human monocytes.

Cimzia does not contain a fragment crystallisable (Fc) region, which is normally present in a complete antibody, and therefore does not fix complement or cause antibody-dependent cell-mediated cytotoxicity *in vitro*. It does not induce apoptosis *in vitro* in human peripheral blood-derived monocytes or lymphocytes, or neutrophil degranulation.

Clinical efficacy

Rheumatoid arthritis
The efficacy and safety of Cimzia have been assessed in 2 randomised, placebo-controlled, double-blind clinical trials in patients ≥ 18 years of age with active rheumatoid arthritis diagnosed according to American College of Rheumatology (ACR) criteria, RA-I (RAPID 1) and RA-II (RAPID 2). Patients had ≥ 9 swollen and tender joints each and had active RA for at least 6 months prior to baseline. Cimzia was administered subcutaneously in combination with oral MTX for a minimum of 6 months with stable doses of at least 10 mg weekly for 2 months in both trials. There is no experience with Cimzia in combination with DMARDs other than MTX.

The efficacy and safety of Cimzia was assessed in DMARD-naïve adult patients with active RA in a randomized, placebo-controlled, double-blind clinical trial (C-EARLY). In the C-EARLY trial patients were ≥ 18 years of age and had ≥ 4 swollen and tender joints each and must have been diagnosed with moderate to severe active and progressive RA within 1 year (as defined by the 2010 ACR/European League Against Rheumatism (EULAR) classification criteria). Patients had a mean time since diagnosis at baseline of 2.9 months and were DMARD naïve (including MTX). For both the Cimzia and placebo arms, MTX was initiated as of Week 0 (10 mg/week), titrated up to maximum tolerated dose by Week 8 (min 15 mg/week, max 25 mg/week allowed), and maintained throughout the study (average dose of MTX after Week 8 for placebo and Cimzia was 22.3 mg/week and 21.1 mg/week respectively).

Table 2 Clinical trial description

Study number	Patient numbers	Active dose regimen	Study objectives
RA-I (52 weeks)	982	400 mg (0,2,4 weeks) with MTX 200 mg or 400 mg every 2 weeks with MTX	Evaluation for treatment of signs and symptoms and inhibition of structural damage. Co-primary endpoints: ACR 20 at Week 24 and change from baseline in mTSS at Week 52
RA-II (24 weeks)	619	400 mg (0,2,4 weeks) with MTX 200 mg or 400 mg every 2 weeks with MTX	Evaluation for treatment of signs and symptoms and inhibition of structural damage. Primary endpoint: ACR 20 at Week 24.
C-EARLY (to 52 weeks)	879	400 mg (0,2,4 weeks) with MTX 200 mg every 2 weeks with MTX	Evaluation for treatment of signs and symptoms and inhibition of structural damage in DMARD naïve patients. Primary endpoint: proportion of subjects in sustained remission* at Week 52

mTSS: modified Total Sharp Score

*Sustained remission at Week 52 is defined as DAS28[ESR] <2.6 at both Week 40 and Week 52.

Signs and symptoms

The results of clinical trials RA-I and RA-II are shown in Table 3. Statistically significantly greater ACR 20 and ACR 50 responses were achieved from Week 1 and Week 2, respectively, in both clinical trials compared to placebo. Responses were maintained through Weeks 52 (RA-I) and 24 (RA-II). Of the 783 patients initially randomised to active treatment in RA-I, 508 completed 52 weeks of placebo-controlled treatment and entered the open-label extension study. Of these, 427 completed 2 years of open-label follow-up and thus had a total exposure to Cimzia of 148 weeks overall. The observed ACR 20 response rate at this timepoint was 91%.The reduction (RA-I) from Baseline in DAS28 (ESR) also was significantly greater ($p<0.001$) at Week 52 (RA-I) and Week 24 (RA-II) compared to placebo and maintained through 2 years in the open-label extension trial to RA-I.

Table 3 ACR response in clinical trials RA-I and RA-II

	Study RA-I Methotrexate combination (24 and 52 weeks)		**Study RA-II Methotrexate combination (24 weeks)**	
Response	Placebo + MTX N=199	Cimzia 200 mg + MTX every 2 weeks N=393	Placebo + MTX N=127	Cimzia 200 mg + MTX every 2 weeks N=246
ACR 20				
Week 24	14%	59%**	9%	57%**
Week 52	13%	53%**	N/A	N/A
ACR 50				

Week 24 Week 52	8% 8%	37%** 38%**	3% N/A	33%** N/A
ACR 70 Week 24 Week 52	 3% 4%	 21%** 21%**	 1% N/A	 16%* N/A
Major Clinical Response[a.]	1%	13%**		

Cimzia vs. placebo: *p≤0.01, ** p<0.001

[a.] Major clinical response is defined as achieving ACR 70 response at every assessment over a continuous 6-month period

Wald p-values are quoted for the comparison of treatments using logistic regression with factors for treatment and region.

Percentage response based upon number of subjects contributing data (n) to that endpoint and time point which may differ from N

The C-EARLY trial met its primary and key secondary endpoints. The key results from the study are presented in table 4.

Table 4: C-EARLY trial: percent of patients in sustained remission and sustained low disease activity at Week 52

Response	Placebo+MTX N= 213	Cimzia 200 mg + MTX N= 655
Sustained remission* (DAS28(ESR) <2.6 at both Week 40 and Week 52)	15.0 %	28.9%**
Sustained low disease activity (DAS28(ESR) ≤3.2 at both Week 40 and Week 52)	28.6 %	43.8%**

*Primary endpoint of C-EARLY trial (to Week 52)

Full analysis set, non-responder imputation for missing values.

**Cimzia+MTX vs placebo+MTX: p<0.001

p value was estimated from a logistic regression model with factors for treatment, region, and time since RA diagnosis at Baseline (≤4 months vs >4 months)

Patients in the Cimzia+MTX group had a greater reduction from baseline in DAS 28 (ESR) compared with the placebo+MTX group observed as early as Week 2 and continued through Week 52 (p<0.001 at each visit). Assessments on remission (DAS28(ESR) <2.6), Low Disease Activity (DAS28(ESR) ≤3.2) status, ACR50 and ACR 70 by visit demonstrated that Cimzia+MTX treatment led to faster and greater responses than PBO+MTX treatment. These results were maintained over 52 weeks of treatment in DMARD-naïve subjects.

Radiographic response

In RA-I, structural joint damage was assessed radiographically and expressed as change in mTSS and its components, the erosion score and joint space narrowing (JSN) score, at Week 52, compared to baseline. Cimzia patients demonstrated significantly less radiographic progression than patients receiving placebo at Week 24 and Week 52 (see Table 5). In the placebo group, 52% of patients experienced no radiographic progression (mTSS $\leq$ 0.0) at Week 52 compared to 69% in the Cimzia 200 mg treatment group.

Table 5 Changes over 12 months in RA-I

	Placebo + MTX N=199 Mean (SD)	**Cimzia 200 mg + MTX N=393 Mean (SD)**	**Cimzia 200 mg + MTX – Placebo + MTX Mean Difference**
mTSS Week 52	2.8 (7.8)	0.4 (5.7)	-2.4
Erosion Score Week 52	1.5 (4.3)	0.1 (2.5)	-1.4
JSN Score Week 52	1.4 (5.0)	0.4 (4.2)	-1.0

p-values were < 0.001 for both mTSS and erosion score and ≤ 0.01 for JSN score. An ANCOVA was fitted to the ranked change from baseline for each measure with region and treatment as factors and rank baseline as a covariate.

Of the 783 patients initially randomised to active treatment in RA-I, 508 completed 52 weeks of placebo-controlled treatment and entered the open-label extension study. Sustained inhibition of progression of structural damage was demonstrated in a subset of 449 of these patients who completed at least 2 years of treatment with Cimzia (RA-I and open-label extension study) and had evaluable data at the 2-year timepoint.

In C-EARLY, Cimzia+ MTX inhibited the radiographic progression compared to placebo+MTX at Week 52 (see Table 6). In the placebo+MTX group, 49.7% of patients experienced no radiographic progression (change in mTSS ≤0.5) at Week 52 compared to 70.3% in the Cimzia+MTX group (p<0.001).

Table 6 Radiographic change at Week 52 in trial C-EARLY

	Placebo +MTX N= 163 Mean (SD)	**Cimzia 200 mg + MTX** N = 528 Mean (SD)	**Cimzia 200 mg + MTX – Placebo +MTX** Difference*
mTSS Week 52	1.8 (4.3)	0.2 (3.2)**	-0.978 (-1.005, -0.500)
Erosion score Week 52	1.1 (3.0)	0.1 (2.1)**	-0.500 (-0.508, -0.366)
JSN score Week 52	0.7 (2.3)	0.1 (1.7)**	0.000 (0.000, 0.000)

Radiographic set with linear extrapolation.
* Hodges-Lehmann point estimate of shift and 95% asymptotic (Moses) confidence interval.
**Cimzia+MTX vs placebo+MTX p<0.001. p value was estimated from an ANCOVA model on the ranks with treatment, region, time since RA diagnosis at Baseline (≤4 months vs >4 months) as factors and Baseline rank as a covariate.

Physical function response and health-related outcomes

In RA-I and RA-II, Cimzia-treated patients reported significant improvements in physical function as assessed by the Health Assessment Questionnaire – Disability Index (HAQ-DI) and in tiredness (fatigue) as reported by the Fatigue Assessment Scale (FAS) from Week 1 through to the end of the studies compared to placebo. In both clinical trials, Cimzia-treated patients reported significantly greater improvements in the SF-36 Physical and Mental Component Summaries and all domain scores. Improvements in physical function and HRQoL were maintained through 2 years in the open-label extension to RA-I. Cimzia-treated patients reported statistically significant improvements in the Work Productivity Survey compared to placebo.

In C-EARLY, Cimzia+MTX-treated patients reported significant improvements at Week 52 compared to placebo+MTX in pain as assessed by the Patient Assessment of Arthritis Pain (PAAP) – 48,5 vs - 44,0 (least square mean) ($p<0.05$).

DoseFlex clinical trial
The efficacy and safety of 2 dose regimens (200 mg every 2 weeks and 400 mg every 4 weeks) of Cimzia versus placebo were assessed in an 18-week, open-label, run-in, and 16-week randomised, double-blind, placebo-controlled clinical trial in adult patients with active rheumatoid arthritis diagnosed according to the ACR criteria who had inadequate response to MTX.

Patients received loading doses of Cimzia 400 mg at weeks 0, 2, and 4 followed by Cimzia 200 mg every 2 weeks during the initial open label period. Responders (achieved ACR 20) at week 16 were randomised at week 18 to Cimzia 200 mg every 2 weeks, Cimzia 400 mg every 4 weeks, or placebo in combination with MTX for an additional 16 weeks (total trial length: 34 weeks). These 3 groups were well balanced with regards to clinical response following the active run-in period (ACR 20: 83-84% at week 18).

The primary endpoint of the study was the ACR 20 responder rate at week 34. The results at week 34 are shown in Table 7. Both Cimzia regimens showed sustained clinical response and were statistically significant compared to placebo at week 34. The ACR 20 endpoint was achieved for both Cimzia 200 mg every 2 weeks and 400 mg every 4 weeks.

Table 7 ACR response in DoseFlex clinical trial at week 34

Treatment regimen week 0 to 16	**Cimzia 400 mg + MTX at week 0, 2 and 4, followed by Cimzia 200 mg + MTX every 2 weeks**		
Randomised, double-blind treatment regimen week 18 to 34	**Placebo + MTX N=69**	**Cimzia 200 mg + MTX every 2 weeks N=70**	**Cimzia 400 mg + MTX every 4 weeks N=69**
ACR 20	45%	67%	65%
p-value*	N/A	0.009	0.017
ACR 50	30%	50%	52%
p-value*	N/A	0.020	0.010
ACR 70	16%	30%	38%
p-value*	N/A	0.052	0.005

N/A: Not Applicable
*Wald p-values for Cimzia 200 mg vs. placebo and Cimzia 400 mg vs. placebo comparisons are estimated from a logistic regression model with factors for treatment

Axial spondyloarthritis (non-radiographic axial spondyloarthritis and ankylosing spondylitis subpopulations)
AS001
The efficacy and safety of Cimzia were assessed in one multicenter, randomized, double-blind, placebo-controlled trial (AS001) in 325 patients ≥18 years of age with adult-onset active axial spondyloarthritis for at least 3 months as defined by the Assessment of Spondyloarthritis International Society (ASAS) Classification Criteria for axial spondyloarthritis. The axial spondyloarthritis overall population included subpopulations with and without

(non-radiographic axial spondyloarthritis [nr-axSpA]) radiographic evidence for ankylosing spondylitis (AS) (also known as radiographic axial spondyloarthritis). Patients had active disease as defined by the Bath Ankylosing Spondylitis Disease Activity Index (BASDAI) ≥ 4, spinal pain ≥ 4 on a 0 to 10 Numerical Rating Scale (NRS) and increased CRP or current evidence of sacroiliitis on Magnetic Resonance Imaging (MRI). Patients must have been intolerant to or had an inadequate response to at least one NSAID. Overall, 16% of patients had prior TNF-antagonist exposure. Patients were treated with a loading dose of Cimzia 400 mg at Weeks 0, 2 and 4 (for both treatment arms) or placebo followed by either 200 mg of Cimzia every 2 weeks or 400 mg of Cimzia every 4 weeks or placebo. 87.7% of patients received concomitant NSAIDs. The primary efficacy endpoint was the ASAS20 response rate at Week 12. The 24-week double-blind, placebo-controlled treatment period of the study was followed by a 24-week dose-blind treatment period, and a 156-week open-label treatment period. The maximum duration of the study was 204 weeks. All patients received Cimzia in both the dose-blind and open-label follow-up periods. A total of 199 subjects (61.2% of randomized subjects) completed the study through Week 204.

Key efficacy outcomes
In AS001 clinical trial, at Week 12 ASAS20 responses were achieved by 58% of patients receiving Cimzia 200 mg every 2 weeks and 64% of patients receiving Cimzia 400 mg every 4 weeks as compared to 38% of patients receiving placebo ($p<0.01$). In the overall population, the percentage of ASAS20 responders was clinically relevant and significantly higher for the Cimzia 200 mg every 2 weeks and Cimzia 400 mg every 4 weeks treatment groups compared to placebo group at every visit from Week 1 through Week 24 ($p\leq0.001$ at each visit). At Weeks 12 and 24, the percentage of subjects with an ASAS40 response was greater in the Cimzia-treated groups compared to placebo.

Similar results were achieved in both the ankylosing spondylitis and non-radiographic axial spondyloarthritis subpopulations. In women, ASAS20 responses were not statistically significantly different from placebo until after the Week 12 time point.

Improvements in ASAS5/6, Partial Remission and BASDAI-50 were statistically signficant at Week 12 and Week 24 and were sustained up to Week 48 in the overall popualtion as well as in the subpopulations. Key efficacy outcomes from the AS001 clinical trial are shown in Table -8.

Among patients remaining in the study, improvements in all afore-mentioned key efficacy outcomes were maintained through Week 204 in the overall population as well as in the subpopulations.

Table 8 Key efficacy outcomes in AS001 clinical trial (percent of patients)

Parameters	**Ankylosing spondylitis**	**Non-radiographic axial spondyloarthritits**	**Axial spondyloarthritis Overall Population**

	Placebo N=57	Cimzia all dosing regimens[a] N=121	Placebo N=50	Cimzia all dosing regimens[a] N=97	Placebo N=107	Cimzia all dosing regimens[a] N=218
ASAS20[b,c]						
Week 12	37%	60%*	40%	61%*	38%	61%**
Week 24	33%	69%**	24%	68%**	29%	68%**
ASAS40[c,d]						
Week 12	19%	45%**	16%	47%**	18%	46%**
Week 24	16%	53%**	14%	51%**	15%	52%**
ASAS 5/6[c,d]						
Week 12	9%	42%**	8%	44%**	8%	43%**
Week 24	5%	40%**	4%	45%**	5%	42%**
Partial remission[c,d]						
Week 12	2%	20%**	6%	29%**	4%	24%**
Week 24	7%	28%**	10%	33%**	9%	30%**
BASDAI 50[c,d]						
Week 12	11%	41%**	16%	49%**	13%	45%**
Week 24	16%	49%**	20%	57%**	18%	52%**

[a] Cimzia all dosing regimen = data from Cimzia 200 mg administered every 2 weeks preceded by a loading dose of 400 mg at Weeks 0, 2 and 4 plus Cimzia 400 mg administered every 4 weeks preceded by a loading dose of 400 mg at Weeks 0, 2 and 4
[b] Results are from the randomized set
[c] Wald p-values are quoted for the comparison of treatments using logistic regression with factors for treatment and region.
[d] Full Analysis Set
NA = not available
*$p \leq 0.05$, Cimzia vs placebo
**$p < 0.001$, Cimzia vs placebo

Spinal mobility
Spinal mobility was assessed in the double-blind, placebo-controlled period by using BASMI at several time points including Baseline, Week 12 and Week 24. Clinically meaningful and statistically significant differences in Cimzia-treated patients compared with placebo-treated patients were demonstrated at each post-baseline visit. The difference from placebo tended to be greater in nr-axSpA than in the AS subpopulation which may be due to less chronic structural damage in nr-axSpA patients.
The improvement in BASMI linear score achieved at Week 24 was maintained through Week 204 for patients who remained in the study.

Physical function response and health-related outcomes
In the AS001 clinical trial, Cimzia-treated patients reported significant improvements in physical function as assessed by the BASFI and in pain as assessed by the Total and Nocturnal Back Pain NRS scales as compared to placebo. Cimzia-treated patients reported significant improvements in tiredness (fatigue) as reported by the BASDAI-fatigue item and in health-related quality of life as measured by the ankylosing spondylitis QoL

(ASQoL) and the SF-36 Physical and Mental Component Summaries and all domain scores as compared to placebo. Cimzia-treated patients reported significant improvements in axial spondyloarthritis-related productivity at work and within household, as reported by the Work Productivity Survey as compared to placebo. For patients remaining in the study, improvements in all afore-mentioned outcomes were largely maintained through Week 204.

Inhibition of inflammation in Magnetic Resonance Imaging (MRI)
In an imaging sub-study including 153 patients, signs of inflammation were assessed by MRI at week 12 and expressed as change from baseline in SPARCC (Spondyloarthritis Research Consortium of Canada) score for sacroiliac joints and ASspiMRI-a score in the Berlin modifications for the spine. At week 12, significant inhibition of inflammatory signs in both sacroiliac joints and the spine was observed in the Cimzia-treated patients (all dose group), in the overall axial spondyloarthritis population as well as in the sub-populations of ankylosing spondylitis and non-radiographic axial spondyloarthritis.
Among patients remaining in the study, who had both baseline values and week 204 values, inhibition of inflammatory signs in both the sacroiliac joints (n=72) and spine (n=82) was largely maintained through Week 204 in the overall axial spondyloarthritis population as well as in both the AS and the nr-axSpA subpopulations.

C-OPTIMISE

The efficacy and safety of dose reduction and treatment withdrawal in patients in sustained remission were assessed in adult patients (18-45 years of age) with early active axSpA (symptom duration of less than 5 years), an ASDAS score ≥2.1 (and similar disease inclusion criteria as in the AS001 study), and who had inadequate response to at least 2 NSAIDs or an intolerance to or contraindication for NSAIDs. Patients included both the AS and nr-axSpA subpopulations of axSpA, and were enrolled into an open-label run-in 48-Week period (Part A) during which they all received 3 loading doses of Cimzia 400 mg at Weeks 0, 2, and 4 followed by Cimzia 200 mg every 2 weeks from Week 6 to Week 46.

Patients who achieved sustained remission (defined as having inactive disease [ASDAS<1.3] over a period of at least 12 weeks) and remained in remission at week 48, were randomized into Part B and received either Cimzia 200 mg every 2 weeks (N=104), Cimzia 200 mg every 4 weeks (dose reduction, N=105), or placebo (treatment withdrawal, N=104) for 48 Weeks.

The primary efficacy variable was the percentage of patients who did not experience a flare during Part B.

Patients who experienced a flare in Part B, ie, had an ASDAS ≥2.1 at 2 consecutive visits or ASDAS >3.5 at any visit during Part B, received escape treatment of Cimzia 200 mg every 2 weeks for at least 12 weeks (with a loading dose of Cimzia 400 mg at Week 0, 2 and 4 in placebo-treated patients).

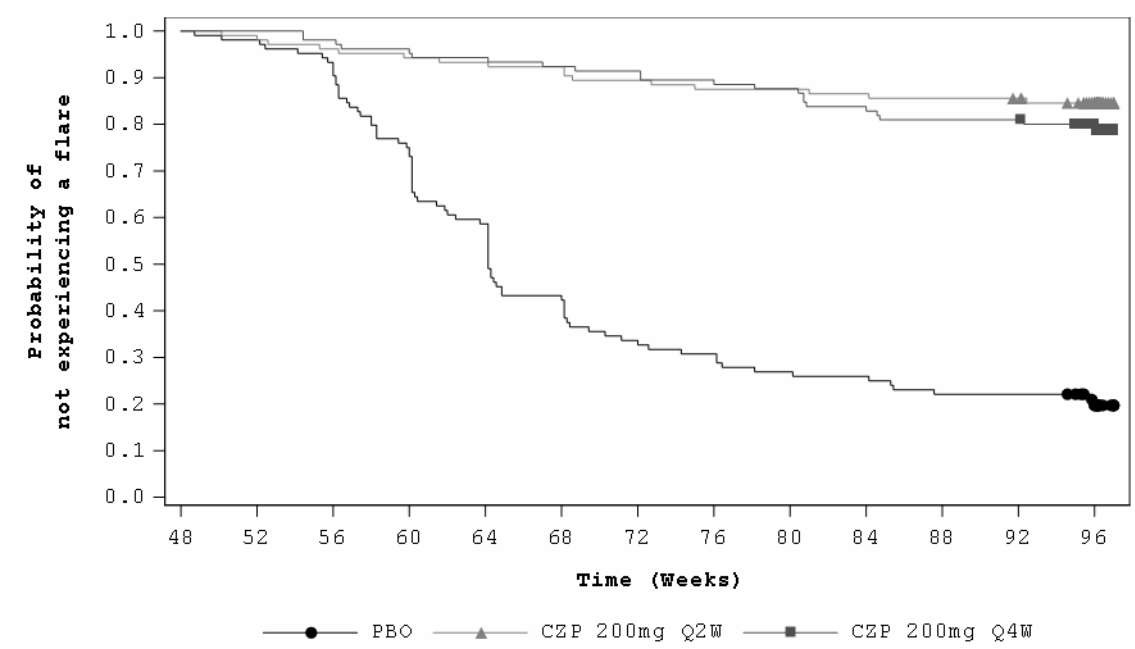
Clinical response

The percentage of patients who achieved sustained remission at Week 48 in Part A was 43.9% for the overall axSpA population, and was similar in the nr-axSpA (45.3%) and AS (42.8%) subpopulations.

Among the patients who were randomized in Part B (N=313), a statistically significant (p <0.001, NRI) greater proportion of patients did not experience a flare when continuing treatment with Cimzia 200 mg every 2 weeks (83.7%) or Cimzia 200 mg every 4 weeks (79.0%) compared with treatment withdrawal (20.2%).

The difference in time to flare between the treatment withdrawal group and either of the Cimzia treatment groups, was statistically significant (p<0.001 for each comparison) and clinically meaningful. In the placebo group, flares started approximately 8 weeks after Cimzia was withdrawn, with the majority of flares occurring within 24 weeks of treatment withdrawal (Figure 1).

Figure 1 Kaplan-Meier curve of time to flare



Non responder imputation (NRI) was used; Results are for the Randomized Set
Note: Time to flare was defined as the time from the date of randomization to the date of the flare. For study participants who did not have a
flare, the time to flare was censored at the date of Week 96 Visit.
The Kaplan-Meier plot was truncated to 97 weeks when <5% of participants were still remaining in the study.

Results for Part B are presented in Table 9.

Table 9 Maintenance of clinical response in Part B at Week 96

Endpoints	Placebo (treatment withdrawal) N=104	CIMZIA 200 mg every 2 weeks N=104	CIMZIA 200 mg every 4 weeks N=105
ASDAS-MI, n (%)[1]			
Part B Baseline (Week 48)	84 (80.8)	90 (86.5)	89 (84.8)
Week 96	11 (10.6)	70 (67.3)*	61 (58.1)*
ASAS40, n (%)[1]			
Part B Baseline (Week 48)	101 (97.1)	103 (99.0)	101 (96.2)
Week 96	22 (21.2)	88 (84.6)*	77 (73.3)*
BASDAI change from Part B baseline (Week 48), LS mean (SE)[2]			
Week 96	3.02 (0.226)	0.56 (0.176)*	0.78 (0.176)*
ASDAS change from Part B baseline (Week 48), LS mean (SE)[2]			
Week 96	1.66 (0.110)	0.24 (0.077)*	0.45 (0.077)*

[1] Non responder imputation (NRI) was used; Results are for the Randomized Set
[2] mixed model with repeated measures (MMRM) was used; Results are for the Randomized Set
ASDAS-MI = Ankylosing Spondylitis Disease Activity Score-Major Improvement; ASAS: Assessment of Sponyloarthritis international Society; ASAS40= ASAS40% response criteria; SE = Standard error;
Note: ASDAS major improvement is defined as a reduction from Baseline ≥2.0.
Note: Part A Baseline was used as a reference to define ASDAS clinical improvement variables and ASAS variables
* Nominal p<0.001, CIMZIA vs. placebo

Inhibition of inflammation in Magnetic Resonance imaging (MRI)

In Part B, signs of inflammation were assessed by MRI at Week 48 and at Week 96 and expressed as change from baseline in SIJ SPARCC and ASspiMRI-a score in the Berlin modifications. Patients who were in sustained remission at Week 48 had no or very low inflammation, and no meaningful increase in inflammation was observed at Week 96 irrespective of their treatment group.

Retreatment in patients that experience a flare

In Part B, 70% (73/104) placebo-treated patients, 14% (15/105) patients treated with Cimzia 200 mg every 4 weeks and 6.7% (7/104) patients treated with Cimzia 200 mg every 2 weeks experienced a flare and were subsequently treated with Cimzia 200 mg every 2 weeks.

Among the 15 patients who flared in the group allocated to Cimzia 200 mg every 4 weeks, all patients completed 12 weeks of rescue therapy with Cimzia and had available ASDAS data, out of which 12 (80%) had ASDAS Low or Inactive disease (i.e. all ASDAS <2.1) after 12 weeks of restarting the open-label treatment.

Among the 73 patients who flared in the group allocated to treatment withdrawal, 71 patients completed 12 weeks of rescue therapy with Cimzia and had available ASDAS data, out of which 64 (90%) had ASDAS Low or

Inactive disease (i.e. all ASDAS < 2.1) after 12 weeks of restarting the open-label treatment.

Based on the results from C-OPTIMISE, a dose reduction in patients in sustained remission after one year of treatment with Cimzia may be considered (see section 4.2). Withdrawal of Cimzia treatment is associated with a high risk of flare.

Non-radiographic axial spondyloarthritis (nr-axSpA)

The efficacy and safety of Cimzia were assessed in a 52 weeks multicenter, randomized, double-blind, placebo-controlled study (AS0006) in 317 patients ≥18 years of age with adult-onset axial spondyloarthritis and back pain for at least 12 months. Patients had to fulfil ASAS criteria for nr- axSpA (not including family history and good response to NSAIDs), and have had objective signs of inflammation indicated by C-reactive protein (CRP) levels above the upper limit of normal and/or sacroiliitis on magnetic resonance imaging (MRI), indicative of inflammatory disease [positive CRP (> ULN) and/or positive MRI], but without definitive radiographic evidence of structural damage on sacroiliac joints. Patients had active disease as defined by the BASDAI ≥4, and spinal pain ≥4 on a 0 to 10 NRS. Patients must have been intolerant to or had an inadequate response to at least two NSAIDs. Patients were treated with placebo or a loading dose of Cimzia 400 mg at Weeks 0, 2 and 4 followed by 200 mg of Cimzia every 2 weeks. Utilization and dose adjustment of standard of care medication (SC) (e.g., NSAIDs, DMARDs, corticosteroids, analgesics) were permitted at any time. The primary efficacy variable was the Ankylosing Spondylitis Disease Activity Score major improvement (ASDAS-MI) response at Week 52. ASDAS-MI response was defined as an ASDAS reduction (improvement) ≥ 2.0 relative to baseline or as reaching the lowest possible score. ASAS 40 was a secondary endpoint.
At baseline, 37 % and 41% of patients had high disease activity (ASDAS ≥2.1, ≤3.5) and 62% and 58% of patient had very high disease activity (ASDAS >3.5) in the CIMZIA group and placebo group respectively.

Clinical response

Study AS0006, performed in subjects without radiographic signs of inflammation in the SI joints, confirmed the effect previously demonstrated in this subgroup in the AS001 study.
At Week 52, a statistically significant greater proportion of patients treated with Cimzia achieved ASDAS-MI response compared to patients treated with placebo. Cimzia-treated patients also had improvements compared to placebo in multiple components of axial spondyloarthritis disease activity, including CRP. At both Week 12 and 52, ASAS 40 responses were significantly greater than placebo. Key results are presented in Table 10.

Table 10: ASDAS-MI and ASAS 40 responses in AS0006 (percent of patients)

Parameters	**Placebo N= 158**	**Cimzia[a] 200 mg every 2 weeks N= 159**
ASDAS-MI Week 52	7%	47%*
ASAS 40 Week 12 Week 52	11% 16%	48%* 57%*

[a] Cimzia administered every 2 weeks preceded by a loading dose of 400 mg at Weeks 0, 2 and 4
* $p<0.001$
All percents reflect the proportion of patients who responded in the full analysis set.

At Week 52, the percentage of patients achieving ASDAS inactive disease (ASDAS < 1.3) was 36.4 % for the Cimzia group compared to 11.8 % for the placebo group.

At Week 52, patients treated with Cimzia showed a clinical meaningful improvement in the MASES compared to placebo (LS mean change from baseline -2.4 ; -0.2 respectively).

Psoriatic arthritis
The efficacy and safety of Cimzia were assessed in a multicentre, randomised, double-blind, placebo controlled clinical trial (PsA001) in 409 patients ≥ 18 years of age with adult-onset active psoriatic arthritis for at least 6 months as defined by the Classification Criteria for Psoriatic Arthritis (CASPAR) criteria. Patients had ≥ 3 swollen and tender joints and increased acute phase reactants. Patients also had active psoriatic skin lesions or a documented history of psoriasis and had failed 1 or more DMARDs. Previous treatment with one TNF-antagonist was allowed and 20% of patients had prior TNF-antagonist exposure. Patients received a loading dose of Cimzia 400 mg at Weeks 0, 2 and 4 (for both treatment arms) or placebo followed by either Cimzia 200 mg every 2 weeks or 400 mg every 4 weeks or placebo every 2 weeks. Patients receiving concomitant NSAIDs and conventional DMARDs were 72.6% and 70.2% respectively. The two primary endpoints were the percentage of patients achieving ACR 20 response at Week 12 and change from baseline in modified Total Sharp Score (mTSS) at Week 24. Efficacy and safety of Cimzia in patients with PsA whose predominant symptoms were sacroiliitis or axial spondyloarthritis have not been separately analysed.
The 24-week double-blind placebo controlled treatment period of the study was followed by a 24-week dose-blind treatment period and an 168-week open-label treatment period. The maximum duration of the study was 216 weeks. All patients received Cimzia in both the dose-blind and open-label follow-up periods. A total of 264 subjects (64.5%) completed the study through Week 216.

ACR response
Cimzia-treated patients had a statistically significant higher ACR 20 response rate at Week 12 and Week 24 compared with placebo-treated patients ($p<0.001$). The percentage of ACR 20 responders was clinically relevant for the Cimzia 200 mg every 2 weeks and Cimzia 400 mg every 4 weeks treatment groups compared to placebo group at every visit after baseline through Week 24 (nominal $p\leq0.001$ at each visit). Cimzia treated patients also had significant improvements in ACR 50 and 70 response rates. At week 12 and 24 improvements in parameters of peripheral activity characteristic of psoriatic arthritis (e.g. number of swollen joints, number of painful/tender joints, dactylitis and enthesitis) were seen in the Cimzia-treated patients (nominal p-value $p<0.01$).

Key efficacy outcomes from the PsA001 clinical trial are shown in Table 11.

Table 11: Key efficacy outcomes in PsA001 clinical trial (percent of patients)

Response	**Placebo** **N=136**	**Cimzia[(a)]200 mg Q2W** **N=138**	**Cimzia[(b)] 400 mg Q4W** **N=135**
ACR20			
Week 12	24%	58%**	52%**
Week 24	24%	64%**	56%**
ACR50			
Week 12	11%	36%**	33%**
Week 24	13%	44%**	40%**
ACR70			
Week 12	3%	25%**	13%*
Week 24	4%	28%**	24%**
Response	**Placebo** **N=86**	**Cimzia[(a)]200 mg Q2W** **N=90**	**Cimzia[(b)] 400 mg Q4W** **N=76**
PASI 75 [(c)]			
Week 12	14%	47%***	47%***
Week 24	15%	62%***	61%***
Week 48	N/A	67%	62%

Table 12: Clinical response in studies CIMPASI-1 and CIMPASI-2 at Week 16 and Week 48

	Week 16			**Week 48**	
CIMPASI-1					
	Placebo N=51	Cimzia 200 mg Q2W [a)] N=95	Cimzia 400 mg Q2W N=88	Cimzia 200 mg Q2W N=95	Cimzia 400 mg Q2W N=88
PGA clear or almost clear[b)]	4.2%	47.0%*	57.9%*	52.7%	69.5%
PASI 75	6.5%	66.5%*	75.8%*	67.2%	87.1%
PASI 90	0.4%	35.8%*	43.6%*	42.8%	60.2%
CIMPASI-2					
	Placebo N=49	Cimzia 200 mg Q2W [a)] N=91	Cimzia 400 mg Q2W N=87	Cimzia 200 mg Q2W N= 91	Cimzia 400 mg Q2W N= 87
PGA clear or almost clear[b)]	2.0%	66.8%*	71.6%*	72.6%	66.6%
PASI 75	11.6%	81.4%*	82.6%*	78.7%	81.3%
PASI 90	4.5%	52.6%*	55.4%*	59.6%	62.0%

[a)] Cimzia 200 mg administered every 2 weeks preceded by a loading dose of 400 mg at Week 0, 2, 4.

[b)] PGA 5 category scale. Treatment success of "clear" (0) or "almost clear"(1) consisted of no signs of psoriasis or normal to pink coloration of lesions, no thickening of the plaque, and none to minimal focal scaling.

* Cimzia vs placebo: $p < 0.0001$.

Response rates and p-values for PASI and PGA were estimated based on a logistic regression model where missing data were imputed using multiple imputation based

on the MCMC method. Subject who escaped or withdrew (based on not achieving PASI 50 response) were treated as non-responders at Week 48.
Results are from the Randomized Set.

The key results of the CIMPACT trial are presented in Table 13.

Table 13: Clinical response in CIMPACT study at Week 12 and Week 16

	Week 12				**Week 16**		
	Placebo N=57	Cimzia 200 mg Q2W [a)] N=165	Cimzia 400 mg Q2W N=167	Etanercept 50 mg BiW N=170	Placebo N=57	Cimzia 200 mg Q2W N=165	Cimzia 400 mg Q2W N=167
PASI 75	5%	61.3%*,§	66.7%*,§§	53.3%	3.8%	68.2%*	74.7%*
PASI 90	0.2%	31.2%*	34.0%*	27.1%	0.3%	39.8%*	49.1%*
PGA clear or almost clear [b)]	1.9%	39.8%**	50.3%*	39.2%	3.4%	48.3%*	58.4%*

[a)] Cimzia 200 mg administered every 2 weeks preceded by a loading dose of 400 mg at Week 0, 2, 4.
[b)] PGA 5 category scale. Treatment success of "clear" (0) or "almost clear"(1) consisted of no signs of psoriasis or normal to pink coloration of lesions, no thickening of the plaque, and none to minimal focal scaling.
* Cimzia vs placebo: $p < 0.0001$.
§ Cimzia 200 mg every 2 weeks versus etanercept 50 mg twice weekly demonstrated non-inferiority (difference between etanercept and Cimzia 200 mg every 2 weeks was 8.0%, 95% CI -2.9, 18.9, based on a pre-specified non-inferiority margin of 10%).
§§ Cimzia 400 mg every 2 weeks versus etanercept 50 mg twice weekly demonstrated superiority ($p<0.05$)
** Cimzia vs Placebo $p < 0.001$. Response rates and p-values based on a logistic regression model.
Missing data were imputed using multiple imputation based on the MCMC method.
Results are from the Randomized Set.

In all 3 studies, the PASI 75 response rate was significantly greater for Cimzia compared to placebo starting at Week 4.

Both doses of Cimzia demonstrated efficacy compared to placebo regardless of age, gender, body weight, BMI, psoriasis disease duration, previous treatment with systemic therapies and previous treatment with biologics.

Maintenance of response
In an integrated analysis of CIMPASI-1 and CIMPASI-2, among patients who were PASI 75 responders at Week 16 and received Cimzia 400 mg every 2 weeks (N=134 of 175 randomised subjects) or Cimzia 200 mg every 2 weeks (N=132 of 186 randomised subjects), the maintenance of response at Week 48 was 98.0% and 87.5%, respectively. Among patients who were PGA clear or almost clear at Week 16 and received Cimzia 400 mg every 2 weeks (N=103 of 175) or Cimzia 200 mg every 2 weeks (N=95 of 186), the maintenance of response at Week 48 was 85.9% and 84.3% respectively.

After an additional 96 weeks of open-label treatment (Week 144) the maintenance of response was evaluated. Twenty-one percent of all randomised subjects were lost to follow-up before Week 144. Approximately 27% of completer study subjects who

entered the open-label treatment between weeks 48 to 144 on Cimzia 200 mg every 2 weeks had their dose increased to Cimzia 400 mg every 2 weeks for maintenance of response. In an analysis in which all patients with treatment failures were considered non-responders, the maintenance of response of the Cimzia 200 mg every 2 weeks treatment group for the respective endpoint, after an additional 96 weeks of open-label therapy, was 84.5% for PASI 75 for study subjects who were responders at Week 16 and 78.4% for PGA clear or almost clear. The maintenance of response of the Cimzia 400 mg every 2 weeks treatment group, who entered the open-label period at Cimzia 200 mg every 2 weeks, was 84.7% for PASI 75 for study subjects who were responders at Week 16 and 73.1% for PGA clear or almost clear.

These response rates were based on a logistic regression model where missing data were imputed over 48 or 144 weeks using multiple imputation (MCMC method) combined with NRI for treatment failures.

In the CIMPACT study, among PASI 75 responders at Week 16 who received Cimzia 400 mg every 2 weeks and were re-randomized to either Cimzia 400 mg every 2 weeks, Cimzia 200 mg every 2 weeks, or placebo, there was a higher percentage of PASI 75 responders at Week 48 in the Cimzia groups as compared to placebo (98.0%, 80.0%, and 36.0%, respectively). Among PASI75 responders at Week 16 who received Cimzia 200 mg every 2 weeks and were re-randomized to either Cimzia 400 mg every 4 weeks, Cimzia 200 mg every 2 weeks, or placebo, there was also a higher percentage of PASI 75 responders at Week 48 in the Cimzia groups as compared to placebo (88.6%, 79.5%, and 45.5%, respectively). Non-responder imputation was used for missing data.

Quality of life / Patient reported outcomes

Statistically significant improvements at Week 16 (CIMPASI-1 and CIMPASI-2) from baseline compared to placebo were demonstrated in the DLQI (Dermatology Life Quality Index). Mean decreases (improvements) in DLQI from baseline ranged from -8.9 to -11.1 with Cimzia 200 mg every 2 weeks, from -9.6 to -10.0 with Cimzia 400 mg every 2 weeks, versus -2.9 to -3.3 for placebo at Week 16.

In addition, at Week 16, Cimzia treatment was associated with a greater proportion of patients achieving a DLQI score of 0 or 1 (Cimzia 400 mg every 2 weeks, 45.5% and 50.6% respectively; Cimzia 200 mg every 2 weeks, 47.4% and 46.2% respectively, versus placebo, 5.9% and 8.2% respectively).

Improvements in DLQI score were sustained or slightly decreased through Week 144.

Cimzia-treated patients reported greater improvements compared to placebo in the Hospital Anxiety and Depression Scale (HADS)-D.

Immunogenicity

The data below reflect the percentage of patients whose test results were considered positive for antibodies to certolizumab pegol in an ELISA and later in a more sensitive method, and are highly dependent on the sensitivity and specificity of the assay. The observed incidence of antibody (including neutralizing antibody) positivity in an assay is highly dependent on several factors, including assay sensitivity and specificity, assay methodology, sample handling, timing of sample collection, concomitant medications, and underlying disease. For these reasons, comparison of the incidence of antibodies to certolizumab pegol in the studies described below with the incidence of antibodies in other studies or to other products may be misleading.

Rheumatoid arthritis

The overall percentage of patients with antibodies to Cimzia detectable on at least 1 occasion was 9.6% in RA placebo-controlled trials. Approximately one-third of antibody-positive patients had antibodies with neutralising activity *in vitro*. Patients treated with concomitant immunosuppressants (MTX) had a lower rate of antibody development than patients not taking immunosuppressants at baseline. Antibody formation was associated with lowered drug plasma concentration and in some patients, reduced efficacy.

In 2 long-term (up to 5 years of exposure) open-label studies, the overall percentage of patients with antibodies to Cimzia detectable on at least one occasion was 13% (8.4% of the overall patients had transient formation of antibodies and an additional 4.7% had persistent formation of antibodies to Cimzia). The overall percentage of patients that were antibody positive with a persistent reduction of drug plasma concentration was estimated to be 9.1%. Similar to the placebo-controlled studies, antibody positivity was associated with reduced efficacy in some patients.

A pharmacodynamic model based on the Phase III trial data predicts that around 15% of the patients develop antibodies in 6 months at the recommended dose regimen (200 mg every 2 weeks following a loading dose) without MTX co-treatment. This number decreases with increasing doses of concomitant MTX treatment. These data are reasonably in agreement with observed data.

Psoriatic arthritis

The overall percentage of patients with antibodies to Cimzia detectable on at least one occasion up to Week 24 was 11.7% in the Phase III placebo-controlled trial in patients with psoriatic arthritis. Antibody formation was associated with lowered drug plasma concentration.

Over the course of the entire study (up to 4 years of exposure), the overall percentage of patients with antibodies to Cimzia detectable on at least one occasion was 17.3% (8.7% had transient formation and an additional 8.7% had persistent formation of antibodies to Cimzia). The overall percentage of patients that were antibody positive with a persistent reduction of drug plasma concentration was estimated to be 11.5%.

Plaque psoriasis

In the Phase III placebo- and active-controlled studies, the percentages of patients who were positive for antibodies to Cimzia on at least one occasion during treatment up to Week 48 were 8.3 % (22/265) and 19.2% (54/281) for the Cimzia 400 mg every 2 weeks and Cimzia 200 mg every 2 weeks respectively. In CIMPASI-1 and CIMPASI-2, sixty patients were antibody positive, 27 of these patients were evaluable for neutralizing antibodies and tested positive. First occurrences of antibody positivity in the open-label treatment period were observed in 2.8% (19/668) of patients. Antibody positivity was associated with lowered drug plasma concentration and in some patients with reduced efficacy.

Axial spondyloarthritis

AS001

The overall percentage of patients with antibodies to Cimzia detectable on at least one occasion up to Week 24 was 4.4% in the AS001 phase III placebo-controlled trial in patients with axial spondyloarthritis (ankylosing spondylitis and non-radiographic axial spondyloarthritis subpopulations). Antibody formation was associated with lowered drug plasma concentration.

Over the course of the entire study (up to 192 weeks), the overall percentage of patients with antibodies to Cimzia detectable on at least one occasion was 9.6% (4.8% had transient formation and an additional 4.8% had persistent formation of antibodies to Cimzia). The overall percentage of patients that were antibody positive with a persistent reduction of drug plasma concentration was estimated to be 6.8%.

AS0006 and C-OPTIMISE

A more sensitive and drug tolerant assay was used for the first time in the AS0006 study (and later also in the C-OPTIMISE study), resulting in a greater proportion of samples having measurable antibodies to Cimzia and thus a greater incidence of patients being classed as antibody positive. In AS0006, the overall incidence of patients who were antibody positive Cimzia was 97% (248/255 patients) after up to 52 weeks of treatment. Only the highest titers were associated with reduced Cimzia plasma levels, however, no impact on efficacy was observed. Similar results in relation to antibodies to Cimzia were seen in C-OPTIMISE. Results from C-OPTIMISE also indicated that a reduction of the dose to Cimzia 200 mg every 4 weeks did not change immunogenicity outcomes.

About 22% (54/248) of the patients in AS0006 who were anti-Cimzia antibody positive at any time, had antibodies that were classified as neutralizing. The neutralizing status of antibodies in C-OPTIMISE was not assessed.

5.2 Pharmacokinetic properties

Certolizumab pegol plasma concentrations were broadly dose-proportional. Pharmacokinetics observed in patients with rheumatoid arthritis and psoriasis were consistent with those seen in healthy subjects.

Absorption

Following subcutaneous administration, peak plasma concentrations of certolizumab pegol were attained between 54 and 171 hours post-injection. Certolizumab pegol has a bioavailability (F) of approximately 80% (range 76% to 88%) following subcutaneous administration compared to intravenous administration.

Distribution

The apparent volume of distribution (V/F) was estimated at 8.01 l in a population pharmacokinetic analysis of patients with rheumatoid arthritis and at 4.71 l in a population pharmacokinetic analysis of patients with plaque psoriasis.

Biotransformation and elimination

PEGylation, the covalent attachment of PEG polymers to peptides, delays the elimination of these entities from the circulation by a variety of mechanisms, including decreased renal clearance, decreased proteolysis, and decreased immunogenicity. Accordingly, certolizumab pegol is an antibody Fab' fragment conjugated with PEG in order to extend the terminal plasma elimination half-life of the Fab' to a value comparable with a whole antibody product. The terminal elimination phase half-life ($t_{1/2}$) was approximately 14 days for all doses tested.

Clearance following subcutaneous dosing was estimated to be 21.0 ml/h in a rheumatoid arthritis population pharmacokinetic analysis, with an inter-subject variability of 30.8% (CV) and an inter-occasion variability of 22.0%. When assessed using the previous ELISA method, the presence of antibodies to certolizumab pegol resulted in an approximately three-fold increase in clearance. Compared with a 70 kg person, clearance is 29% lower and 38% higher, respectively, in individual RA patients weighing 40 kg and 120 kg. The clearance following subcutaneous dosing in patients with psoriasis was 14 ml/h with an inter-subject variability of 22.2% (CV).

The Fab' fragment comprises protein compounds and is expected to be degraded to peptides and amino acids by proteolysis. The de-conjugated PEG component is rapidly eliminated from plasma and is to an unknown extent excreted renally.

Special populations

Renal impairment

Specific clinical trials have not been performed to assess the effect of renal impairment on the pharmacokinetics of certolizumab pegol or its PEG fraction. However, population pharmacokinetic analysis based on subjects with mild renal impairment showed no effect of creatinine clearance. There are insufficient data to provide a dosing recommendation in moderate and severe renal impairment. The pharmacokinetics of the PEG fraction of certolizumab pegol are expected to be dependent on renal function but have not been assessed in patients with renal impairment.

Hepatic impairment

Specific clinical trials have not been performed to assess the effect of hepatic impairment on the pharmacokinetics of certolizumab pegol.

Elderly patients (≥ 65 years old)
Specific clinical trials have not been performed in elderly patients subjects. However, no effect of age was observed in a population pharmacokinetic analysis in patients with rheumatoid arthritis in which 78 subjects (13.2% of the population) were aged 65 or greater and the oldest subject was aged 83 years. No effect of age was observed in a population pharmacokinetic analysis in adult patients with plaque psoriasis.

Pregnancy
In a clinical study, 21 women received Cimzia at a maintenance dose of 200 mg or 400 mg every 2 weeks or 400 mg every 4 weeks, during pregnancy and at least 13 weeks post-partum (see section 4.6).
Based on population PK modeling, median systemic Cimzia exposure for the dosing regimens studied were estimated to be 22% (AUC) and 36% (Cmin) lower during pregnancy (with the greatest reduction observed during the third trimester) relative to post-partum or in non-pregnant individuals.
Although certolizumab pegol plasma concentrations were lower during pregnancy compared with post-partum, they were still within the range of concentrations observed in non-pregnant adult patients with psoriasis, axSpA, and rheumatoid arthritis.

Gender
There was no effect of gender on the pharmacokinetics of certolizumab pegol. As clearance decreases with decreasing body weight, females may generally obtain somewhat higher systemic exposure of certolizumab pegol.

Pharmacokinetic/pharmacodynamic relationship
On the basis of Phase II and Phase III clinical trial data in patients with rheumatoid arthritis, a population exposure-response relationship was established between average plasma concentration of certolizumab pegol during a dosing interval (C_{avg}) and efficacy (ACR 20 responder definition). The typical C_{avg} that produces half the maximum probability of ACR 20 response (EC50) was 17 µg/ml (95% CI: 10-23 µg/ml). Similarly, on the basis of Phase III clinical trial data in patients with psoriasis, a population exposure-response relationship was established between plasma concentration of certolizumab pegol and PASI with an EC90 of 11.1 µg/ml.

5.3 Preclinical safety data

The pivotal non-clinical safety studies were conducted in the cynomolgus monkey. In rats and monkeys, at doses higher than those given to humans, histopathology revealed cellular vacuolation, present mainly in macrophages, in a number of organs (lymph nodes, injection sites, spleen, adrenal, uterine, cervix, choroid plexus of the brain, and in the epithelial cells of the choroid plexus). It is likely that this finding was caused by cellular uptake of the PEG moiety. *In vitro* functional studies of human vacuolated macrophages indicated all functions tested were retained. Studies in rats indicated that > 90% of the administered PEG was eliminated in 3 months following a single dose, with the urine being the main route of excretion.

Certolizumab pegol does not cross-react with rodent TNF. Therefore, reproductive toxicology studies have been performed with a homologous reagent recognising rat TNF. The value of these data to the evaluation of human risk may be limited. No adverse effects were seen on maternal well-being or female fertility, embryo-foetal and peri- and post-natal reproductive indices in rats using a rodent anti-rat TNFα PEGylated Fab' (cTN3 PF) following sustained TNFα suppression. In male rats, reduced sperm motility and a trend of reduced sperm count were observed.

Distribution studies have demonstrated that placental and milk transfer of cTN3 PF to the foetal and neonatal circulation is negligible. Certolizumab pegol does not bind to the human neonatal Fc receptor (FcRn). Data from a human closed-circuit placental transfer model *ex vivo* suggest low or negligible transfer to the foetal compartment. In addition, experiments of FcRn-mediated transcytosis in cells transfected with human FcRn showed negligible transfer (see section 4.6).

No mutagenic or clastogenic effects were demonstrated in preclinical studies. Carcinogenicity studies have not been performed with certolizumab pegol.

6 PHARMACEUTICAL PARTICULARS

6.1 List of excipients

Sodium acetate

Sodium chloride

Water for injections

6.2 Incompatibilities

In the absence of compatibility studies, this medicinal product must not be mixed with other medicinal products.

6.3 Shelf life

2 years.

See also section 6.4 for shelf-life related to storage at room temperature up to a maximum of 25°C.

6.4 Special precautions for storage

Store in a refrigerator (2°C – 8°C).

Do not freeze.

Keep the dose-dispenser cartridge in the outer carton in order to protect from light.

The dose-dispenser cartridges may be stored at room temperature (up to 25°C) for a single period of maximum 10 days with protection from light. At the end of this period the dose-dispenser cartridges **must be used or discarded**.

6.5 Nature and contents of container

One ml dose-dispenser cartridge containing a pre-filled syringe (type I glass) with a plunger stopper (bromobutyl rubber). The pre-filled syringe contains 200 mg of certolizumab pegol. The needle shield is styrene butadiene rubber which contains a derivative of natural rubber latex (see section 4.4).

Pack size of 2 dose-dispenser cartridges and 2 alcohol wipes.

Multipack containing 6 (3 packs of 2) dose-dispenser cartridge and 6 (3 packs of 2) alcohol wipes.

Multipack containing 10 (5 packs of 2) dose-dispenser cartridge and 10 (5 packs of 2) alcohol wipes.

Not all pack sizes may be marketed.

6.6 Special precautions for disposal

Comprehensive instructions for the preparation and administration of Cimzia in a dose-dispenser cartridge are given in the package leaflet and in the user manual provided with the electromechanical injection device ava.

This medicinal product is for single use only. Any unused product or waste material should be disposed of in accordance with local requirements.

7 MARKETING AUTHORISATION HOLDER

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