1. NAME OF THE MEDICINAL PRODUCT

Olumiant film-coated tablets 2mg

Olumiant film-coated tablets 4mg

2. QUALITATIVE AND QUANTITATIVE COMPOSITION

Olumiant film-coated tablets 2mg

Each film-coated tablet contains 2mg baricitinib.

Olumiant film-coated tablets 4mg

Each film-coated tablet contains 4mg baricitinib.

For the full list of excipients, see section 6.1.

3. PHARMACEUTICAL FORM

Film-coated tablet.

Olumiant film-coated tablets 2mg

Light pink, oblong, debossed with “Lilly” on one side and “2” on the other.

Olumiant film-coated tablets 4mg

Medium pink, round, debossed with “Lilly” on one side and “4” on the other.

4. CLINICAL PARTICULARS

4.1 Therapeutic indications

Rheumatoid Arthritis

Olumiant is indicated for the treatment of moderate to severe active rheumatoid arthritis in adult patients who have responded inadequately to, or who are intolerant to one or more disease-modifying anti-rheumatic drugs. Olumiant may be used as monotherapy or in combination with methotrexate (see sections 4.4, 4.5 and 5.1 for available data on different combinations).

Atopic Dermatitis

Olumiant is indicated for the treatment of moderate to severe atopic dermatitis in adult patients whose disease is not adequately controlled with topical prescription therapies or when those therapies are not advisable

4.2 Posology and method of administration

Treatment should be initiated by physicians experienced in the diagnosis and treatment of the conditions for which Olumiant is indicated.

Posology

Rheumatoid Arthritis

The recommended dose of Olumiant is 4mg once daily. A dose of 2mg once daily is appropriate for patients such as those aged ≥ 75 years and may be appropriate for patients with a history of chronic or recurrent infections. A dose of 2mg once daily may also be considered for patients who have achieved sustained control of disease activity with 4mg once daily and are eligible for dose tapering (see section 5.1).

Atopic Dermatitis

The recommended dose of Olumiant is 2mg once daily. A dose of 4 mg once daily may be considered for patients who have not achieved sustained control of disease activity with 2 mg once daily. Dose tapering to a dose of 2mg once daily may also be considered for patients who have achieved sustained control of disease activity with 4mg once daily and are eligible for dose tapering (see section 5.1).

Olumiant can be used with or without topical corticosteroids. The efficacy of Olumiant can be enhanced when given with topical corticosteroids (see section 5.1). Topical calcineurin inhibitors may be used, but should be reserved for sensitive areas only, such as the face, neck, intertriginous and genital areas.

Consideration should be given to discontinuing treatment in patients who show no evidence of therapeutic benefit after 8 weeks of treatment with 4mg.

Treatment initiation

Treatment should not be initiated in patients with an absolute lymphocyte count (ALC) less than 0.5 x 10^9 cells/L, an absolute neutrophil count (ANC) less than 1 x 10^9 cells/L, or who have a haemoglobin value less than 8 g/dL. Treatment may be initiated once values have improved above these limits (see section 4.4).

Renal impairment

The recommended dose is 2mg once daily in patients with creatinine clearance between 30 and 60 mL/min. Olumiant is not recommended for use in patients with creatinine clearance < 30 mL/min (see section 5.2).

Hepatic impairment

No dose adjustment is required in patients with mild or moderate hepatic impairment. Olumiant is not recommended for use in patients with severe hepatic impairment (see section 5.2).

Co-administration with OAT3 inhibitors

The recommended dose is 2mg once daily in patients taking Organic Anion Transporter 3 (OAT3) inhibitors with a strong inhibition potential, such as probenecid (see section 4.5).

Elderly

Clinical experience in patients ≥ 75 years is very limited and in these patients a starting dose of 2mg is appropriate.

Paediatric population

The safety and efficacy of Olumiant in children and adolescents aged 0 to 18 years have not yet been established. No data are available.

Method of administration

Oral use.

Olumiant is to be taken once daily with or without food and may be taken at any time of the day.

4.3 Contraindications

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

Pregnancy (see section 4.6).

4.4 Special warnings and precautions for use

Mortality

In a large, randomized postmarketing safety study of another JAK inhibitor in patients 50 years of age and older with at least one cardiovascular risk factor, a higher rate of all-cause mortality, including sudden cardiovascular death was observed in patients treated with the JAK inhibitor compared with TNF blockers. Consider the benefits and risks for the individual patient prior to initiating or continuing therapy with baricitinib.

Major Adverse Cardiovascular Events

In a large, randomized, postmarketing safety study of another JAK inhibitor in patients 50 years of age and older with at least one cardiovascular risk factor, a higher rate of major adverse cardiovascular events (MACE) defined as cardiovascular death, non-fatal myocardial infarction (MI), and non-fatal stroke was observed with the JAK inhibitor

compared to those treated with TNF blockers. Patients who are current or past smokers are at additional increased risk. Consider the benefits and risks for the individual patient prior to initiating or continuing therapy with baricitinib, particularly in patients who are current or past smokers and patients with other cardiovascular risk factors. Patients should be informed about the symptoms of serious cardiovascular events and the steps to take if they occur. Baricitinib is not recommended in patients with history of myocardial infarction or stroke.

Infections

Baricitinib is associated with an increased rate of infections such as upper respiratory tract infections compared to placebo (see section 4.8). The risks and benefits of treatment with Olumiant should be carefully considered prior to initiating therapy in patients with active, chronic or recurrent infections (see section 4.2). If an infection develops, the patient should be monitored carefully and Olumiant therapy should be temporarily interrupted if the patient is not responding to standard therapy. Olumiant treatment should not be resumed until the infection resolves.

Tuberculosis

Patients should be screened for tuberculosis (TB) before starting Olumiant therapy. Olumiant should not be given to patients with active TB. Patients with latent TB should be treated with standard anti-mycobacterial therapy before administering Olumiant.

Haematological abnormalities

Absolute Neutrophil Count (ANC) $< 1 \times 10^9$ cells/L and Absolute Lymphocyte Count (ALC) $< 0.5 \times 10^9$ cells/L were reported in less than 1% of patients in clinical trials. Haemoglobin < 8 g/dL was reported in less than 1 % of patients in rheumatoid arthritis clinical trials. Treatment should not be initiated, or should be temporarily interrupted, in patients with an ANC $< 1 \times 10^9$ cells/L, ALC $< 0.5 \times 10^9$ cells/L or haemoglobin < 8 g/dL observed during routine patient management (see section 4.2).

The risk of lymphocytosis is increased in elderly patients with rheumatoid arthritis. Rare cases of lymphoproliferative disorders have been reported.

Viral reactivation

Viral reactivation, including cases of herpes virus reactivation (e.g., herpes zoster, herpes simplex), were reported in clinical studies (see section 4.8). In rheumatoid arthritis clinical studies, herpes zoster was reported more commonly in patients ≥ 65 years of age who had previously been treated with both biologic and conventional disease-modifying

antirheumatic drugs (DMARDs). If a patient develops herpes zoster, Olumiant treatment should be temporarily interrupted until the episode resolves.

Screening for viral hepatitis should be performed in accordance with clinical guidelines before starting therapy with Olumiant. For patients who test positive for hepatitis B or C infection, consultation with a physician with expertise in the treatment of hepatitis is recommended.

Vaccination

No data are available on the response to vaccination with live vaccines in patients receiving baricitinib. Use with live, attenuated vaccines during, or immediately prior to, Olumiant therapy is not recommended. Prior to initiating Olumiant, it is recommended that all patients be brought up to date with all immunisations in agreement with current immunisation guidelines.

Lipids

Dose dependent increases in blood lipid parameters were reported in patients treated with baricitinib compared to placebo (see section 4.8). Elevations in LDL cholesterol decreased to pre-treatment levels in response to statin therapy. Lipid parameters should be assessed approximately 12 weeks following initiation of Olumiant therapy and thereafter patients should be managed according to international clinical guidelines for hyperlipidaemia. The effect of these lipid parameter elevations on cardiovascular morbidity and mortality has not been determined.

Hepatic transaminase elevations

Dose dependent increases in blood alanine transaminase (ALT) and aspartate transaminase (AST) activity were reported in patients treated with baricitinib compared to placebo (see section 4.8). Increases in ALT and AST to ≥ 5 and ≥ 10 x upper limit of normal (ULN) were reported in less than 1% of patients in clinical trials. In rheumatoid arthritis clinical studies in treatment-naïve patients, combination with methotrexate resulted in increased frequency of hepatic transaminase elevations compared with baricitinib monotherapy (see section 4.8). If increases in ALT or AST are observed during routine patient management and drug-induced liver injury is suspected, Olumiant should be temporarily interrupted until this diagnosis is excluded.

Malignancy

In a large, randomized, postmarketing safety study of another JAK inhibitor in patients 50 years of age and older with at least one cardiovascular risk factor, a higher rate of malignancies (excluding non-melanoma skin cancer (NMSC)) was observed in patients

treated with the JAK inhibitor compared to those treated with TNF blockers. A higher rate of lymphomas was observed in patients treated with the JAK inhibitor compared to those treated with TNF blockers. A higher rate of lung cancers was observed in current or past smokers treated with the JAK inhibitors compared to those treated with TNF blockers. In this study, current or past smokers had an additional risk of overall malignancies. Consider the benefits and risks for the individual patient prior to initiating or continuing therapy with baricitinib, particularly in patients with a known malignancy (other than successfully treated NMSC), patients who develop a malignancy, and patients who are current or past smokers.

Thrombosis

In a large, randomized, postmarketing safety study of another JAK inhibitor in patients 50 years of age and older with at least one cardiovascular risk factor, a higher incidence of thrombosis, including deep vein thrombosis and pulmonary embolism were observed with the JAK inhibitor compared to those treated with TNF blockers. If clinical features of thrombosis occur, patients should discontinue baricitinib. Baricitinib should be avoided in patients that are at risk of thrombosis.

Laboratory monitoring

Table 1. Laboratory measures and monitoring guidance

Laboratory Measure	Action	Monitoring Guidance
Lipid parameters	Patients should be managed according to international clinical guidelines for hyperlipidaemia	12 weeks after initiation of treatment and thereafter according to international clinical guidelines for hyperlipidaemia
Absolute Neutrophil Count (ANC)	Treatment should be interrupted if ANC $< 1 \times 10^9$ cells/L and may be restarted once ANC return above this value	Before treatment initiation and thereafter according to routine patient management
Absolute Lymphocyte Count (ALC)	Treatment should be interrupted if ALC $< 0.5 \times 10^9$ cells/L and may be restarted once ALC return above this value	
Haemoglobin (Hb)	Treatment should be interrupted if Hb < 8 g/dL and may be restarted once Hb return above this value	
Hepatic transaminases	Treatment should be temporarily interrupted if drug-induced liver injury is suspected	

Immunosuppressive medicinal products

Combination with biologic DMARDs, biologic immunomodulators or other Janus kinase (JAK) inhibitors is not recommended, as a risk of additive immunosuppression cannot be excluded. In rheumatoid arthritis, data concerning use of baricitinib with potent immunosuppressive medicinal products (e.g. mycophenolic acid, azathioprine, tacrolimus, ciclosporin) are limited and caution should be exercised when using such combinations (see section 4.5).

In atopic dermatitis, combination with ciclosporin or other potent immunosuppressants has not been studied and is not recommended (see section 4.5).

Hypersensitivity

In post-marketing experience, cases of drug hypersensitivity associated with baricitinib administration have been reported. If any serious allergic or anaphylactic reaction occurs, baricitinib should be discontinued immediately.

Diverticulitis

Events of diverticulitis and gastrointestinal perforation have been reported in clinical trials and from postmarketing sources. Baricitinib should be used with caution in patients with diverticular disease and especially in patients chronically treated with concomitant medications associated with an increased risk of diverticulitis: nonsteroidal anti-inflammatory drugs, corticosteroids, and opioids. Patients presenting with new onset abdominal signs and symptoms should be evaluated promptly for early identification of diverticulitis or gastrointestinal perforation.

Excipients

This medicinal product contains less than 1 mmol sodium (23 mg) per tablet, i.e., essentially “sodium-free”.

4.5 Interaction with other medicinal products and other forms of interaction

Pharmacodynamic interactions

Immunosuppressive medicinal products:

Combination with biologic DMARDs, biologic immunomodulators or other JAK inhibitors has not been studied. In rheumatoid arthritis, use of baricitinib with potent immunosuppressive medicinal products such as mycophenolic acid, azathioprine, tacrolimus, or ciclosporin was limited in clinical studies of baricitinib, and a risk of additive immunosuppression cannot be excluded. In atopic dermatitis, combination with ciclosporin

or other potent immunosuppressants has not been studied and is not recommended (see section 4.4).

Potential for other medicinal products to affect the pharmacokinetics of baricitinib

Transporters

In vitro, baricitinib is a substrate for organic anionic transporter (OAT)3, P-glycoprotein (Pgp), breast cancer resistance protein (BCRP) and multidrug and toxic extrusion protein (MATE)2-K. In a clinical pharmacology study, dosing of probenecid (an OAT3 inhibitor with strong inhibition potential) resulted in approximately a 2-fold increase in $AUC_{(0-\infty)}$ with no change in t_{max} or C_{max} of baricitinib. Consequently, the recommended dose in patients taking OAT3 inhibitors with a strong inhibition potential, such as probenecid, is 2mg once daily (see section 4.2). No clinical pharmacology study has been conducted with OAT3 inhibitors with less inhibition potential. The prodrug leflunomide rapidly converts to teriflunomide which is a weak OAT3 inhibitor and therefore may lead to an increase in baricitinib exposure. Since dedicated interaction studies have not been conducted, caution should be used when leflunomide or teriflunomide are given concomitantly with baricitinib. Concomitant use of the OAT3 inhibitors ibuprofen and diclofenac may lead to increased exposure of baricitinib, however their inhibition potential of OAT3 is less compared to probenecid and thus a clinically relevant interaction is not expected. Coadministration of baricitinib with ciclosporin (Pgp/BCRP inhibitor) or methotrexate (substrate of several transporters including OATP1B1, OAT1, OAT3, BCRP, MRP2, MRP3, and MRP4) resulted in no clinically meaningful effects on baricitinib exposure.

Cytochrome P450 enzymes

In vitro, baricitinib is a cytochrome P450 enzyme (CYP)3A4 substrate although less than 10% of the dose is metabolised via oxidation. In clinical pharmacology studies, coadministration of baricitinib with ketoconazole (strong CYP3A inhibitor) resulted in no clinically meaningful effect on the PK of baricitinib. Coadministration of baricitinib with fluconazole (moderate CYP3A/CYP2C19/CYP2C9 inhibitor) or rifampicin (strong CYP3A inducer) resulted in no clinically meaningful changes to baricitinib exposure.

Gastric pH modifying agents

Elevating gastric pH with omeprazole had no clinically significant effect on baricitinib exposure.

Potential for baricitinib to affect the pharmacokinetics of other medicinal products

Transporters

In vitro, baricitinib is not an inhibitor of OAT1, OAT2, OAT3, organic cationic transporter (OCT) 2, OATP1B1, OATP1B3, BCRP, MATE1 and MATE2-K at clinically relevant

concentrations. Baricitinib may be a clinically relevant inhibitor of OCT1, however there are currently no known selective OCT1 substrates for which clinically significant interactions might be predicted. In clinical pharmacology studies there were no clinically meaningful effects on exposure when baricitinib was coadministered with digoxin (Pgp substrate) or methotrexate (substrate of several transporters).

Cytochrome P450 enzymes

In clinical pharmacology studies, coadministration of baricitinib with the CYP3A substrates simvastatin, ethinyl oestradiol, or levonorgestrel resulted in no clinically meaningful changes in the PK of these medicinal products.

4.6 Fertility, pregnancy and lactation

Pregnancy

The JAK/STAT pathway has been shown to be involved in cell adhesion and cell polarity which can affect early embryonic development. There are no adequate data from the use of baricitinib in pregnant women. Studies in animals have shown reproductive toxicity (see section 5.3). Baricitinib was teratogenic in rats and rabbits. Animal studies indicate that baricitinib may have an adverse effect on bone development *in utero* at higher dosages.

Olumiant is contraindicated during pregnancy (see section 4.3). Women of childbearing potential have to use effective contraception during and for at least 1 week after treatment. If a patient becomes pregnant while taking Olumiant the parents should be informed of the potential risk to the foetus.

Breast-feeding

It is unknown whether baricitinib/metabolites are excreted in human milk. Available pharmacodynamic/toxicological data in animals have shown excretion of baricitinib in milk (see section 5.3).

A risk to newborns/infants cannot be excluded and Olumiant should not be used during breast-feeding. A decision must be made whether to discontinue breast-feeding or to discontinue Olumiant therapy taking into account the benefit of breast-feeding for the child and the benefit of therapy for the woman.

Fertility

Studies in animals suggest that treatment with baricitinib has the potential to decrease female fertility while on treatment, but there was no effect on male spermatogenesis (see section 5.3).

4.7 Effects on ability to drive and use machines

Olumiant has no or negligible influence on the ability to drive and use machines.

4.8 Undesirable effects

In placebo-controlled rheumatoid arthritis clinical trials, for up to 16 weeks, the most commonly reported adverse drug reactions (ADRs) occurring in ≥ 2% of patients treated with Olumiant monotherapy or in combination with conventional synthetic DMARDs were increased LDL cholesterol (33.6%), upper respiratory tract infections (14.7%) and headache (3.8%). Infections reported with Olumiant treatment included herpes zoster (1.4%).

In placebo-controlled atopic dermatitis clinical trials, for up to 16 weeks, the most commonly reported ADRs occurring in ≥ 2% of patients treated with Olumiant monotherapy or in combination with topical corticosteroids were similar to those observed in rheumatoid arthritis, except for increased LDL cholesterol (13.2%) and herpes simplex (6.1%). In patients treated with baricitinib in the atopic dermatitis clinical trials, the frequency of herpes zoster was very rare.

Rheumatoid Arthritis

A total of 3,770 patients were treated with Olumiant in clinical studies in rheumatoid arthritis representing 10,127 patient-years of exposure. Of these, 2,960 rheumatoid arthritis patients were exposed to Olumiant for at least one year. Seven placebo-controlled studies were integrated (1,142 patients on 4mg once daily and 1,215 patients on placebo) to evaluate the safety of Olumiant in comparison to placebo for up to 16 weeks after treatment initiation.

Atopic Dermatitis

A total of 2,531 patients were treated with Olumiant in clinical studies in atopic dermatitis representing a total of 2,247 patient years of exposure. Of these, 1,106 atopic dermatitis patients were exposed to Olumiant for at least one year.

Five placebo controlled studies were integrated (489 patients on 4mg once daily and 743 patients on placebo) to evaluate the safety of Olumiant in comparison to placebo for up to 16 weeks after treatment initiation.

Table 2. Adverse Reactions

Frequency estimate: Very common (≥ 1/10), common (≥ 1/100 to < 1/10), uncommon (≥ 1/1,000 to < 1/100), rare (≥ 1/10,000 to < 1/1,000), very rare (< 1/10,000). The frequencies in Table 2 are based on integrated data across both rheumatoid arthritis and

atopic dermatitis indications unless stated otherwise; where notable differences in frequency are observed in one indication alone, these are presented in the footnotes below the table.

System Organ Class	Very common	Common	Uncommon
Infections and infestations	Upper respiratory tract infections	Herpes zoster,[b] Herpes simplex Gastroenteritis Urinary tract infections Pneumonia[d]	
Blood and lymphatic system disorders		Thrombocytosis $> 600 \times 10^9$ cells/L[a, d]	Neutropaenia $< 1 \times 10^9$ cells/L[a]
Metabolism and nutrition disorders	Hypercholesterolaemia[a]		Hypertriglyceridaemia[a]
Nervous system disorders		Headache	
Gastrointestinal disorders		Nausea[d] Abdominal pain	Diverticulitis
Hepatobiliary disorders		ALT increased ≥3 x ULN[a, d]	AST increased ≥3 x ULN[a]
Skin and subcutaneous tissue disorders		Rash Acne[c]	
Immune disorders			Swelling of the face, Urticaria
Respiratory, thoracic, mediastinal disorders			Pulmonary embolism
Vascular disorders			Deep Vein Thrombosis

Investigations		Creatine phosphokinase increased > 5 x ULN[a, c]	Weight increased

[a] Includes changes detected during laboratory monitoring (see text below).

[b] Frequency for herpes zoster is based on rheumatoid arthritis clinical trials.

[c] Frequency for acne and creatine phosphokinase increased > 5 x ULN is based on the pooled rheumatoid arthritis and atopic dermatitis clinical trials. In patients treated with baricitinib in the rheumatoid arthritis clinical trials, the frequency of those events was uncommon.

[d] Frequency for pneumonia, thrombocytosis > 600 x 109 cells/L, nausea, and ALT ≥ 3 x ULN is based on the pooled rheumatoid arthritis and atopic dermatitis clinical trials. In patients treated with baricitinib in the atopic dermatitis clinical trials, the frequency of those events was uncommon.

Gastrointestinal disorders

In rheumatoid arthritis clinical studies, in treatment-naïve patients, through 52 weeks, the frequency of nausea was greater for the combination treatment of methotrexate and Olumiant (9.3%) compared to methotrexate alone (6.2%) or Olumiant alone (4.4%). Nausea was most frequent during the first 2 weeks of treatment. In atopic dermatitis clinical studies, for up to 16 weeks, the frequency of nausea with Olumiant was 0.8%.

In rheumatoid arthritis controlled studies, for up to 16 weeks, abdominal pain occurred in 2.1% of patients treated with Olumiant 4mg and 1.4% of patients treated with placebo. The frequency of abdominal pain in atopic dermatitis clinical studies was similar. The cases were usually mild, transient, not associated with infectious or inflammatory gastrointestinal disorders, and did not lead to treatment interruption.

Infections

Rheumatoid Arthritis

In controlled studies, for up to 16 weeks, the incidence rate of all infections (rate of patients with ≥ 1 event per 100 patient-years of exposure) was 101 with Olumiant compared to 83 in the placebo group. Most infections were mild to moderate in severity. In studies which included both doses, infections were reported in 31.9%, 28.8% and 24.1% of patients up to 16 weeks in the 4mg, 2mg and placebo groups, respectively. Reporting rates for Olumiant compared to placebo for the infection-related ADRs were: Upper respiratory tract infections (14.7% vs. 11.7%), urinary tract infections (3.4% vs. 2.7%), gastroenteritis (1.6% vs. 0.8%), herpes simplex (1.8% vs. 0.7%), and herpes zoster (1.4% vs. 0.4%). In treatment-naïve patients, for up to 52 weeks, the frequency of upper respiratory tract infections was greater for the combination treatment of methotrexate and

Olumiant (26.0%) compared to methotrexate alone (22.9%) or Olumiant alone (22.0%). The rate of serious infections with Olumiant (1.1%) was similar to placebo (1.2%). For Olumiant, the most common serious infections were herpes zoster, and cellulitis. The rate of serious infections remained stable during long term exposure. The overall incidence rate of serious infections in the clinical trial programme was 3.2 per 100 patient-years.

Atopic Dermatitis

In controlled studies, for up to 16 weeks, the incidence rate of all infections (rate of patients with ≥ 1 event per 100 patient-years of exposure) was 155 with Olumiant 4mg compared to 118 in the placebo group. Most infections were mild to moderate in severity. Infections were reported in 31.5%, 29.8% and 24.2% of patients up to 16 weeks in the 4mg, 2mg and placebo groups, respectively. The percentage of patients reporting infection related ADRs for Olumiant 4mg compared to placebo were: Upper respiratory tract infections (17.5% vs. 14.1%), urinary tract infections (2.0% vs. 0.8%), gastroenteritis (1.2% vs. 0.5%), herpes simplex (6.1% vs. 2.7%), herpes zoster (0% vs. 0.3%) and pneumonia (0% vs 0.1%). In atopic dermatitis clinical studies, the frequency of infections was generally similar to those observed in rheumatoid arthritis patients except for pneumonia which was uncommon and herpes zoster which was very rare. There were less skin infections requiring antibiotic treatment with Olumiant 4mg (3.4%) than with placebo (4.4%). The same percentage of patients with serious infections was observed with Olumiant 4mg and placebo (0.6%). The overall incidence rate of serious infections with baricitinib in the atopic dermatitis clinical trial programme was 2.1 per 100 patient-years.

Hepatic transaminase elevations

In rheumatoid arthritis controlled studies, for up to 16 weeks, alanine transaminase (ALT) and aspartate transaminase (AST) elevations ≥ 3 x upper limit of normal (ULN) were observed in 1.4% and 0.8% of patients treated with Olumiant, compared to 1.0% and 0.8% respectively of patients treated with placebo.

In treatment-naïve patients, the combination of Olumiant with potentially hepatotoxic medicinal products, such as methotrexate, resulted in increased frequency of these elevations. For up to 52 weeks, the frequency of ALT and AST elevations ≥ 3 x ULN were greater for the combination treatment of methotrexate and Olumiant (7.5% and 3.8%) compared to methotrexate alone (2.9% and 0.5%) or Olumiant alone (1.9% and 1.3%).

In atopic dermatitis controlled studies, for up to 16 weeks, ALT and AST elevations ≥ 3 x ULN were uncommonly observed in 0.2% and 0.5% of patients treated with Olumiant 4mg, compared to 0.8% and 0.8% respectively of patients treated with placebo.

Across indications, dose dependent increases in blood ALT and AST activity were also reported in studies extended over week 16. Most cases of hepatic transaminase elevations were asymptomatic and transient. The pattern and incidence of elevation in ALT/AST remained stable over time including in the long-term extension study.

Lipid elevations

In rheumatoid arthritis clinical studies, baricitinib treatment was associated with dose-dependent increases in lipid parameters including total cholesterol, triglycerides, LDL cholesterol, and HDL cholesterol. There was no change in the LDL/HDL ratio. Elevations were observed at 12 weeks and remained stable thereafter at a higher value than baseline including in the long-term extension study.

In studies which included both doses, a dose-relationship was observed with increased total cholesterol ≥ 5.17 mmol/L reported in 48.8%, 34.7% and 17.8% of patients up to 16 weeks in the 4mg, 2mg and placebo groups, respectively.

Elevations in LDL cholesterol decreased to pre-treatment levels in response to statin therapy.

In atopic dermatitis clinical studies, baricitinib treatment was associated with increases in lipid parameters including total cholesterol, LDL cholesterol, and HDL cholesterol. Elevations were observed at 12 weeks and mean total and LDL cholesterol increased through week 52. There was no increase in the LDL/HDL ratio. No dose relationships were observed in controlled studies, for up to 16 weeks for total cholesterol, LDL cholesterol, or HDL cholesterol. There was no increase in triglycerides levels.

In controlled studies, for up to 16 weeks, the following frequencies were observed for Olumiant 4mg vs. placebo:

- Increased total cholesterol ≥ 5.17 mmol/L:
  - Rheumatoid Arthritis: 49.1% vs.15.8%, respectively
  - Atopic Dermatitis: 20.7% vs. 10.0%, respectively
- Increased LDL cholesterol ≥ 3.36 mmol/L:
  - Rheumatoid Arthritis: 33.6% vs. 10.3%, respectively
  - Atopic Dermatitis: 13.2% vs. 6.3%, respectively
- Increased HDL cholesterol ≥ 1.55 mmol/L:
  - Rheumatoid Arthritis: 42.7% vs. 13.8%, respectively
  - Atopic Dermatitis: 25.3% vs. 14.7%, respectively
- Increased triglycerides ≥ 5.65 mmol/L:
  - Rheumatoid Arthritis: 0.4% vs. 0.5%, respectively

- Atopic Dermatitis: 0.7% vs. 0.8%, respectively

Creatine phosphokinase (CPK)

In rheumatoid arthritis controlled studies, for up to 16 weeks, increases in CPK values were uncommon. Significant increases (> 5 x ULN) occurred in 0.8% of patients treated with Olumiant and 0.3% of patients treated with placebo. A dose relationship was observed with CPK elevations ≥ 5 x ULN of normal reported in 1.5%, 0.8% and 0.6% of patients at 16 weeks in the 4mg, 2mg and placebo groups, respectively. In atopic dermatitis controlled studies, for up to 16 weeks, increases in CPK values were common and occurred in 3.3%, 2.5%, and 1.9% of patients treated with Olumiant 4mg, 2mg, and placebo, respectively. Across indications, most cases were transient and did not require treatment discontinuation. In rheumatoid arthritis and atopic dermatitis clinical trials, there were no confirmed cases of rhabdomyolysis. Elevations of CPK were observed at 4 weeks and remained stable at a higher value than baseline thereafter including in the long-term extension study.

Neutropaenia

In rheumatoid arthritis and atopic dermatitis controlled studies, for up to 16 weeks, decreases in neutrophil counts below 1 x 10^9 cells/L occurred in 0.3% of patients treated with Olumiant compared to 0% of patients treated with placebo. There was no clear relationship between decreases in neutrophil counts and the occurrence of serious infections. However, in clinical studies, treatment was interrupted in response to ANC < 1 x 10^9 cells/L. The pattern and incidence of decreases in neutrophil counts remained stable at a lower value than baseline over time including in the long-term extension study.

Thrombocytosis

In rheumatoid arthritis controlled studies, for up to 16 weeks, increases in platelet counts above 600 x 10^9 cells/L occurred in 2.0% of patients treated with Olumiant 4mg and 1.1% of patients treated with placebo. In atopic dermatitis controlled studies, for up to 16 weeks, increases in platelet counts above 600 x 10^9 cells/L occurred in 0.6% of patients treated with Olumiant 4mg and 0% of patients treated with placebo. The frequency of thrombocytosis in atopic dermatitis studies was uncommon and lower than that observed in the rheumatoid arthritis patients.

No association was observed between increased platelet counts and adverse events of a thrombotic nature. The pattern and incidence of increases in platelet counts remained stable at a higher value than baseline over time including in the long term extension study.

4.9 Overdose

Single doses up to 40mg and multiple doses of up to 20mg daily for 10 days have been administered in clinical trials without dose-limiting toxicity. Adverse events were comparable to those seen at lower doses and no specific toxicities were identified. Pharmacokinetic data of a single dose of 40mg in healthy volunteers indicate that more than 90% of the administered dose is expected to be eliminated within 24 hours. In case of an overdose, it is recommended that the patient be monitored for signs and symptoms of adverse reactions. Patients who develop adverse reactions should receive appropriate treatment.

5. PHARMACOLOGICAL PROPERTIES

5.1 Pharmacodynamic properties

Pharmacotherapeutic group: Selective immunosuppressants, ATC code: L04AA37

Mechanism of action

Baricitinib is a selective and reversible inhibitor of Janus kinase (JAK)1 and JAK2. In isolated enzyme assays, baricitinib inhibited the activities of JAK1, JAK2, Tyrosine Kinase 2 and JAK3 with IC_{50} values of 5.9, 5.7, 53 and > 400 nM, respectively.

Janus kinases (JAKs) are enzymes that transduce intracellular signals from cell surface receptors for a number of cytokines and growth factors involved in haematopoiesis, inflammation and immune function. Within the intracellular signalling pathway, JAKs phosphorylate and activate signal transducers and activators of transcription (STATs), which activate gene expression within the cell. Baricitinib modulates these signalling pathways by partially inhibiting JAK1 and JAK2 enzymatic activity, thereby reducing the phosphorylation and activation of STATs.

Pharmacodynamic effects

Inhibition of IL-6 induced STAT3 phosphorylation

Administration of baricitinib resulted in a dose dependent inhibition of IL-6 induced STAT3 phosphorylation in whole blood from healthy subjects with maximal inhibition observed 2 hours after dosing which returned to near baseline by 24 hours.

Immunoglobulins

Mean serum IgG, IgM, and IgA values decreased by 12 weeks after starting treatment with Olumiant, and remained stable at a lower value than baseline through at least 104 weeks. For most patients, changes in immunoglobulins occurred within the normal reference range.

Lymphocytes

Mean absolute lymphocyte count increased by 1 week after starting treatment with Olumiant, returned to baseline by week 24, and then remained stable through at least 104 weeks. For most patients, changes in lymphocyte count occurred within the normal reference range.

C-reactive protein

In patients with rheumatoid arthritis, decreases in serum C-reactive protein (CRP) were observed as early as 1 week after starting treatment with Olumiant and were maintained throughout dosing.

Creatinine

In rheumatoid arthritis, baricitinib induced a mean increase in serum creatinine levels of 3.8 µmol/L after two weeks of treatment, as compared to placebo, which remained stable thereafter during up to 104 weeks of treatment. This may be due to inhibition of creatinine secretion by baricitinib in the renal tubules. Consequently, estimates of the glomerular filtration rate based on serum creatinine may be slightly reduced, without actual loss of renal function or the occurrence of renal adverse events. Similar observations have been made in atopic dermatitis. In atopic dermatitis, baricitinib was associated with a decrease in cystatin C (also used to estimate glomerular filtration rate) of 0.1 mg/L at week 4, with no further decrease noted up to week 16.

In vitro skin models

In an in-vitro human skin model treated with pro-inflammatory cytokines (i.e., IL-4, IL-13, IL-31), baricitinib reduced epidermal keratinocyte pSTAT3 expression, and increased the expression of filaggrin, a protein that plays a role in skin barrier function and in the pathogenesis of atopic dermatitis.

Vaccine study

The influence of baricitinib on the humoral response to non-live vaccines was evaluated in 106 RA patients under stable treatment with baricitinib 2 or 4mg, receiving inactivated pneumococcal or tetanus vaccination. The majority of these patients (n = 94) were co-treated with methotrexate. For the total population, pneumococcal vaccination resulted in a satisfactory IgG immune response in 68.0% (95% CI: 58.4%, 76.2%) of the patients. In 43.1% (95% CI: 34.0%, 52.8%) of the patients, a satisfactory IgG immune response to tetanus vaccination was achieved.

Clinical efficacy

Rheumatoid Arthritis

The efficacy and safety of Olumiant once daily was assessed in 4 Phase III randomised, double-blind, multicentre studies in patients with moderate to severe active rheumatoid arthritis diagnosed according to the ACR/EULAR 2010 criteria (see Table 3). Patients over 18 years of age were eligible to participate. The presence of at least 6 tender and 6 swollen joints was required at baseline. All patients who completed these studies were eligible to enrol in a long term extension study for up to 4 years continued treatment.

The RA-BEGIN Study in methotrexate (MTX)-naïve patients is supportive for the target population of patients with an inadequate response to, or intolerance to, other DMARDs (section 4.1).

Table 3. Clinical Trial Summary

Study name (duration)	**Population** (number)	**Treatment arms**	**Summary of key outcome measures**
RA-BEGIN (52 weeks)	MTX-naïve[1] (584)	• Olumiant 4mg QD • Olumiant 4mg QD + MTX • MTX	• Primary endpoint: ACR20 at week 24 • Physical function (HAQ-DI) • Radiographic progression (mTSS) • Low disease activity and Remission (SDAI)
RA-BEAM (52 weeks)	MTX-IR[2] (1305)	• Olumiant 4mg QD • Adalimumab 40mg SC Q2W • Placebo All patients on background MTX	• Primary endpoint: ACR20 at week 12 • Physical function (HAQ-DI) • Radiographic progression (mTSS) • Low disease activity and Remission (SDAI) • Morning Joint Stiffness
RA-BUILD (24 weeks)	cDMARD-IR[3] (684)	• Olumiant 4mg QD • Olumiant 2mg QD • Placebo On background cDMARDs[5] if on stable cDMARD at study entry	• Primary endpoint: ACR20 at week 12 • Physical function (HAQ-DI) • Low disease activity and remission (SDAI) • Radiographic progression (mTSS) • Morning Joint Stiffness

Study name (duration)	**Population** (number)	**Treatment arms**	**Summary of key outcome measures**
RA-BEACON (24 weeks)	TNF-IR[4] (527)	• Olumiant 4mg QD • Olumiant 2mg QD • Placebo On background cDMARDs[5]	• Primary endpoint: ACR20 at week 12 • Physical function (HAQ-DI) • Low disease activity and Remission (SDAI)

Abbreviations: QD = Once daily; Q2W = Once every 2 weeks; SC = Subcutaneously; ACR = American College of Rheumatology; SDAI = Simplified Disease Activity Index; HAQ-DI = Health Assessment Questionnaire-Disability Index; mTSS = modified Total Sharp Score

[1] Patients who had received less than 3 doses of Methotrexate (MTX); naïve to other conventional or biologic DMARDs
[2] Patients who had an inadequate response to MTX (+/- other cDMARDs); biologic-naïve
[3] Patients who had an inadequate response or were intolerant to ≥ 1 cDMARDs; biologic-naïve
[4] Patients who had an inadequate response or were intolerant to ≥ 1 bDMARDs; including at least one TNF inhibitor
[5] Most common concomitant cDMARDs included MTX, hydroxychloroquine, leflunomide and sulfasalazine

Clinical Response
In all studies, patients treated with Olumiant 4mg once daily had statistically significantly higher ACR20, ACR50 and ACR70 response at 12 weeks compared to placebo, MTX or adalimumab (see Table 4).Time to onset of efficacy was rapid across measures with significantly greater responses seen as early as week 1. Continued, durable response rates were observed, with ACR20/50/70 responses maintained for at least 2 years including the long-term extension study.

Treatment with Olumiant 4mg, alone or in combination with cDMARDs, resulted in significant improvements in all individual ACR components, including tender and swollen joint counts, patient and physician global assessments, HAQ-DI, pain assessment and CRP, compared to placebo or MTX monotherapy. In RA-BEAM, treatment with Olumiant

resulted in significant improvement in patient and physician global assessments, HAQ-DI, pain assessment and CRP at Weeks 12, 24 and 52 compared to adalimumab.

In placebo-controlled trials in which MTX was not required, 501 subjects randomized to baricitinib 2mg or 4mg received MTX as background therapy, and 303 received conventional DMARDs other than MTX (approximately half with MTX and half without). The most common concomitant DMARDs in these subjects were MTX (79% of patients), hydroxychloroquine (19%), leflunomide (11%), and sulphasalazine (9%). No relevant differences regarding efficacy and safety were observed in subgroups defined by types of concomitant DMARDs used in combination with baricitinib.

Remission and low disease activity

A statistically significantly greater proportion of patients treated with Olumiant 4mg compared to placebo or MTX achieved remission, as defined by SDAI ≤ 3.3 and CDAI ≤ 2.8, at weeks 12 and 24 (Table 4).

In all 4 studies, a significantly higher proportion of patients treated with Olumiant 4mg compared to placebo or MTX achieved low disease activity or remission (DAS28-ESR or DAS28-hsCRP ≤ 3.2 and DAS28-ESR or DAS28-hsCRP < 2.6) at Weeks 12 and 24.

Greater rates of remission compared to placebo were observed as early as week 4. Including data from a long-term extension study, remission and low disease activity rates were maintained for at least 2 years.

Table 4: Response, Remission and Physical Function

Study	**RA-BEGIN** MTX-naïve patients			**RA-BEAM** MTX-IR patients			**RA-BUILD** cDMARD-IR patients			**RA-BEACON** TNF-IR patients		
Treatment group	MTX	OLU 4mg	OLU 4mg + MTX	PBO	OLU 4mg	ADA 40mg Q2W	PBO	OLU 2mg	OLU 4mg	PBO	OLU 2mg	OLU 4mg
N	210	159	215	488	487	330	228	229	227	176	174	177
ACR20:												
Week 12	59%	79%***	77%***	40%	70%***†	61%***	39%	66%***	62%***	27%	49%***	55%***
Week 24	62%	77%**	78%***	37%	74%***†	66%***	42%	61%***	65%***	27%	45%***	46%***
Week 52	56%	73%***	73%***		71%††	62%						

Study	**RA-BEGIN** MTX-naïve patients			**RA-BEAM** MTX-IR patients			**RA-BUILD** cDMARD-IR patients			**RA-BEACON** TNF-IR patients		
ACR50:												
Week 12	33%	55%***	60%***	17%	45%***††	35%***	13%	33%***	34%***	8%	20%**	28%***
Week 24	43%	60%**	63%***	19%	51%***	45%***	21%	41%***	44%***	13%	23%*	29%***
Week 52	38%	57%***	62%***		56%†	47%						
ACR70:												
Week 12	16%	31%***	34%***	5%	19%***†	13%***	3%	18%***	18%***	2%	13%***	11%**
Week 24	21%	42%***	40%***	8%	30%***†	22%***	8%	25%***	24%***	3%	13%***	17%***
Week 52	25%	42%***	46%***		37%	31%						
DAS28-hsCR ≤ 3.2:												
Week 12	30%	47%***	56%***	14%	44%***††	35%***	17%	36%***	39%***	9%	24%***	32%***
Week 24	38%	57%***	60%***	19%	52%***	48%***	24%	46%***	52%***	11%	20%*	33%***
Week 52	38%	57%***	63%***		56%†	48%						
DAS28-ESR ≤ 3.2:												
Week 12	15%	21%	34%***	7%	24%***	21%***	7%	21%***	22%***	4%	13%**	12%**
Week 24	23%	36%**	39%***	10%	32%***	34%***	10%	29%***	32%***	7%	11%	17%**
Week 52	27%	36%	45%***		39%	36%						
SDAI ≤ 3.3:												
Week 12	6%	14%*	20%***	2%	8%***	7%***	1%	9%***	9%***	2%	2%	5%
Week 24	10%	22%**	23%***	3%	16%***	14%***	4%	17%***	15%***	2%	5%	9%**
Week 52	13%	25%**	30%***		23%	18%						
CDAI ≤ 2.8:												
Week 12	7%	14%*	19%***	2%	8%***	7%**	2%	10%***	9%***	2%	3%	6%
Week 24	11%	21%**	22%**	4%	16%***	12%***	4%	15%***	15%***	3%	5%	9%*
Week 52	16%	25%*	28%**		22%	18%						
HAQ-DI Minimum Clinically Important Difference (decrease in HAQ-DI score of ≥ 0.30):												
Week 12	60%	81%***	77%***	46%	68%***	64%***	44%	60%***	56%**	35%	48%*	54%***
Week 24	66%	77%*	74%	37%	67%***†	60%***	37%	58%***	55%***	24%	41%***	44%***
Week 52	53%	65%*	67%**		61%	55%						

Note: Proportions of responders at each time point based on those initially randomised to treatment (N). Patients who discontinued or received rescue therapy were considered as non-responders thereafter.
Abbreviations: ADA = adalimumab; MTX = methotrexate; OLU = Olumiant; PBO = Placebo
* p ≤0.05; ** p ≤0.01; *** p ≤0.001 vs. placebo (vs. MTX for study RA-BEGIN)
† p ≤0.05; † † p ≤0.01; † † † p ≤0.001 vs. adalimumab

Radiographic response
The effect of Olumiant on progression of structural joint damage was evaluated radiographically in studies RA-BEGIN, RA-BEAM and RA-BUILD and assessed using the modified Total Sharp Score (mTSS) and its components, the erosion score and joint space narrowing score.

Treatment with Olumiant 4mg resulted in a statistically significant inhibition of progression of structural joint damage (Table 5). Analyses of erosion and joint space narrowing scores were consistent with the overall scores. The proportion of patients with no radiographic progression (mTSS change ≤ 0) was significantly higher with Olumiant 4mg compared to placebo at weeks 24 and 52.

Table 5. Radiographic Changes

Study	**RA-BEGIN** MTX-naïve patients			**RA-BEAM** MTX-IR patients			**RA-BUILD** cDMARD-IR patients		
Treatment group	MTX	OLU 4mg	OLU 4mg + MTX	PBO[a]	OLU 4mg	ADA 40mg Q2W	PBO	OLU 2mg	OLU 4mg
Modified Total Sharp Score, mean change from baseline:									
Week 24	0.61	0.39	0.29*	0.90	0.41***	0.33***	0.70	0.33*	0.15**
Week 52	1.02	0.80	0.40**	1.80	0.71***	0.60***			
Erosion Score, Mean change from baseline:									
Week 24	0.47	0.33	0.26*	0.61	0.29***	0.24***	0.47	0.30	0.11**
Week 52	0.81	0.55	0.34**	1.23	0.51***	0.42***			
Joint Space Narrowing Score, mean change from baseline:									
Week 24	0.14	0.06	0.03	0.29	0.12**	0.10**	0.23	0.03*	0.04*
Week 52	0.21	0.25	0.06	0.58	0.21***	0.19**			
Proportion of patients with no radiographic progression[b]:									
Week 24	68%	76%	81%**	70%	81%***	83%***	74%	72%	80%
Week 52	66%	69%	80%**	70%	79%**	81%**			

Abbreviations: ADA = adalimumab; MTX = methotrexate; OLU = Olumiant; PBO = Placebo

[a] Placebo data at week 52 derived using linear extrapolation

[b] No progression defined as mTSS change ≤ 0.

* p ≤0.05; ** p ≤0.01; *** p ≤0.001 vs. placebo (vs. MTX for study RA-BEGIN)

Physical function response and health-related outcomes

Treatment with Olumiant 4mg, alone or in combination with cDMARDs, resulted in a significant improvement in physical function compared to all comparators (placebo, MTX, adalimumab), as measured by HAQ-DI, at 12, 24 and 52 weeks. The proportion of patients achieving a clinically significant improvement (HAQ-DI ≥ 0.30) was also higher with Olumiant compared to placebo or MTX at week 12 (Table 4). Improvements were seen as early as Week 1 and, in studies RA-BEGIN and RA-BEAM, this was maintained for up to 52 weeks.

Treatment with Olumiant 4mg, alone or in combination with cDMARDs, resulted in a significant improvement in pain compared to all comparators (placebo, MTX, adalimumab), as measured on a 0-100 visual analogue scale, at 12 weeks. Statistically

significant pain reduction was seen as early as Week 1 and in studies RA-BEGIN and RA-BEAM this was maintained for up to 52 weeks.

In RA-BEAM and RA-BUILD, treatment with Olumiant 4mg resulted in a significant improvement in the mean duration and severity of morning joint stiffness compared to placebo or adalimumab as assessed using daily electronic patient diaries for 12 weeks.

In all studies, Olumiant-treated patients reported improvements in patient-reported quality of life, as measured by the Short Form (36) Health Survey (SF-36) Physical Component Score and fatigue, as measured by the Functional Assessment of Chronic Illness Therapy-Fatigue score (FACIT-F).

Olumiant 4mg vs. 2mg
Differences in efficacy between the 4mg and the 2mg doses were most notable in the bDMARD-IR population (RA-BEACON), in which statistically significant improvements in the ACR components of swollen joint count, tender joint count and ESR were shown for Olumiant 4mg compared to placebo at week 24 but not for Olumiant 2mg compared to placebo. In addition, for both study RA-BEACON and RA-BUILD, onset of efficacy was faster and the effect size was generally larger for the 4mg dose groups compared to 2mg.

In a long-term extension study, patients from Studies RA-BEAM, RA-BUILD and RA-BEACON who achieved sustained low disease activity or remission (CDAI ≤ 10) after at least 15 months of treatment with Olumiant 4mg once daily were re-randomized 1:1 in a double-blind manner to continue 4mg once daily or reduce dose to 2mg once daily. The majority of patients maintained low disease activity or remission based on CDAI score:

- At week 12: 234/251 (93%) continuing 4mg vs. 207/251 (82%) reduced to 2mg ($p \leq 0.001$)
- At week 24: 163/191 (85%) continuing 4mg vs. 144/189 (76%) reduced to 2mg ($p \leq 0.05$)
- At week 48: 57/73 (78%) continuing 4mg vs. 51/86 (59%) reduced to 2mg ($p \leq 0.05$)

The majority of patients who lost their low disease activity or remission status after dose reduction could regain disease control after the dose was returned to 4mg.

Atopic Dermatitis
The efficacy and safety of baricitinib as monotherapy or in combination with topical corticosteroids (TCS) were assessed in 3 Phase III randomised, double-blind, placebo-controlled, 16 week studies (BREEZE-AD1, -AD2, and -AD7). The studies included 1,568 patients with moderate to severe atopic dermatitis defined by Investigator's Global

Assessment (IGA) score ≥ 3, an Eczema Area and Severity Index (EASI) score ≥ 16, and a body surface area (BSA) involvement of ≥ 10%. Eligible patients were over 18 years of age and had previous inadequate response or were intolerant to topical medication. Patients were permitted to receive rescue treatment (which included topical or systemic therapy), at which time they were considered non-responders. At baseline of study BREEZE-AD7, all patients were on concomitant topical corticosteroids therapy and patients were permitted to use topical calcineurin inhibitors. All patients who completed these studies were eligible to enrol in a long term extension study (BREEZE AD-3) for up to 2 years of continued treatment.

The Phase III randomised, double-blind, placebo-controlled BREEZE-AD4 study evaluated the efficacy of baricitinib in combination with topical corticosteroids over 52 weeks in 463 patients with moderate to severe AD with failure, intolerance, or contraindication to oral ciclosporin treatment.

Baseline Characteristics

In the placebo-controlled Phase III studies (BREEZE-AD1, -AD2, -AD7, and -AD4), across all treatment groups, 37% were female, 64% were Caucasian, 31% were Asian and 0.6% were Black, and the mean age was 35.6 years. In these studies, 42% to 51% of patients had a baseline IGA of 4 (severe atopic dermatitis), and 54% to 79% of patients had received prior systemic treatment for atopic dermatitis. The baseline mean EASI score ranged from 29.6 to 33.5, the baseline weekly averaged Itch Numerical Rating Scale (NRS) ranged from 6.5 to 7.1, the baseline mean Dermatology Life Quality Index (DLQI) ranged from 13.6 to 14.9, and the baseline mean Hospital Anxiety and Depression Scale (HADS) Total score ranged from 10.9 to 12.1.

Clinical Response

*16-week Monotherapy (BREEZE-AD1, -AD2) and TCS Combination (*BREEZE-AD7*) Studies*

A significantly larger proportion of patients randomised to baricitinib 4 mg achieved an IGA 0 or 1 response (primary outcome), EASI75, or an improvement of ≥ 4 points on the Itch NRS compared to placebo at week 16 (Table 6). Figure 1 shows the mean percent change from baseline in EASI up to week 16.

A significantly greater proportion of patients randomised to baricitinib 4 mg achieved a ≥ 4-point improvement in the Itch NRS compared to placebo (within the first week of treatment for BREEZE-AD1 and AD2, and as early as week 2 for BREEZE-AD7; $p < 0.002$).

Treatment effects in subgroups (weight, age, gender, race, disease severity, and previous treatment, including immunosuppressants) were consistent with the results in the overall study population.

Table 6. Efficacy of baricitinib at week 16 (FAS[a])

	Monotherapy						TCS Combination		
Study	**BREEZE- AD1**			**BREEZE-AD2**			**BREEZE- AD7**		
Treatment Group	PBO	BARI 2 mg	BARI 4 mg	PBO	BARI 2 mg	BARI 4 mg	PBO + TCS	BARI 2 mg + TCS	BARI 4 mg + TCS
N	249	123	125	244	123	123	109	109	111
IGA 0 or 1, % responders[b, c]	4.8	11.4**	16.8**	4.5	10.6**	13.8**	14.7	23.9	30.6**
EASI-75, % responders[c]	8.8	18.7**	24.8**	6.1	17.9**	21.1**	22.9	43.1*	47.7**
Itch NRS (≥ 4 point improvement), % responders[c, d]	7.2	12.0	21.5**	4.7	15.1**	18.7**	20.2	38.1*	44.0**

BARI = Baricitinib; PBO = Placebo

* statistically significant vs placebo without adjustment for multiplicity; ** statistically significant vs placebo with adjustment for multiplicity.

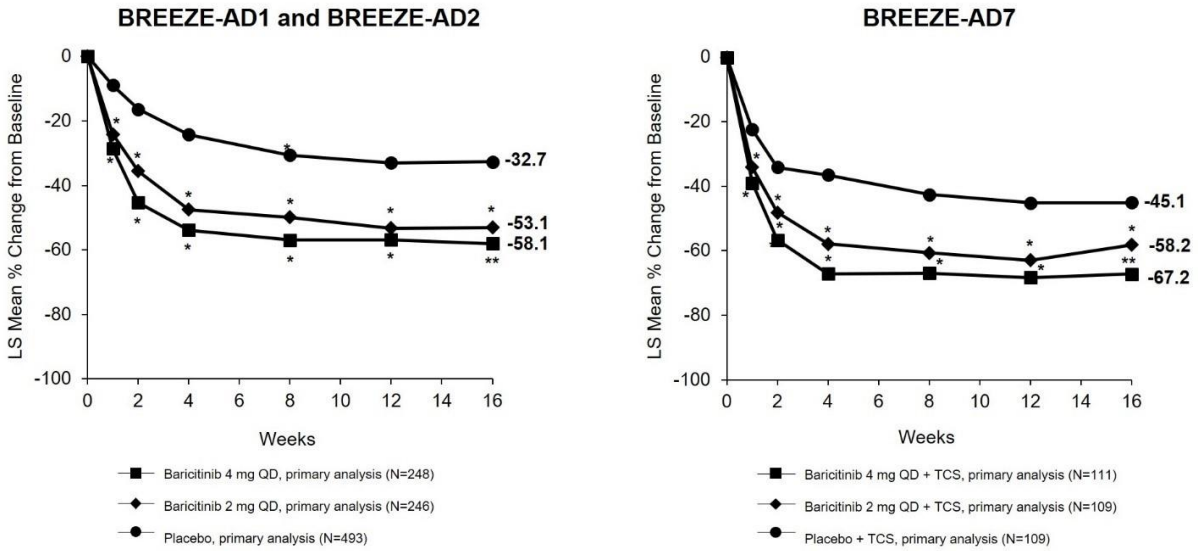
[a] Full analysis set (FAS) including all randomised patients.

[b] Responder was defined as a patient with IGA 0 or 1 (“clear” or “almost clear”) with a reduction of ≥ 2 points on 0-4 IGA scale.

[c] Non-Responder Imputation: Patients who received rescue treatment or with missing data were considered as non-responders.

[d] Results shown in subset of patients eligible for assessment (patients with itch NRS ≥ 4 at baseline).

Figure 1. Mean percent change from baseline in EASI (FAS)[a]



LS = Least squares; * statistically significant vs placebo without adjustment for multiplicity; ** statistically significant vs placebo with adjustment for multiplicity.

[a] Full analysis set (FAS) including all patients randomised. Data collected after rescue therapy or after permanent study drug discontinuation were considered missing. LS means are from Mixed Model with Repeated Measures (MMRM) analyses.

Maintenance of Response

To evaluate maintenance of response, 1,373 subjects treated with baricitinib for 16 weeks in BREEZE-AD1 (N = 541), BREEZE-AD2 (N = 540) and BREEZE-AD7 (N = 292) were eligible to enrol in a long term extension study BREEZE-AD3. Data are available up to 68 weeks of cumulative treatment for patients from BREEZE-AD1 and BREEZE-AD2, and up to 32 weeks of cumulative treatment for patients from BREEZE-AD7. Continued response was observed in patients with at least some response (IGA 0, 1 or 2) after initiating baricitinib.

Quality of Life/Patient-Reported Outcomes in Atopic Dermatitis

In both monotherapy studies (BREEZE-AD1 and BREEZE-AD2) and in the concomitant TCS study (BREEZE-AD7), baricitinib 4mg significantly improved patient-reported outcomes, including itch NRS, sleep (ADSS), skin pain (skin pain NRS), quality of life (DLQI) and symptoms of anxiety and depression (HADS) that were uncorrected for multiplicity, at 16 weeks compared to placebo (See Table 7).

Table 7. Quality of Life/Patient-Reported Outcomes results of baricitinib monotherapy and baricitinib in combination with TCS at week 16 (FAS)[a]

	Monotherapy						TCS Combination		
Study	**BREEZE-AD1**			**BREEZE-AD2**			**BREEZE-AD7**		
Treatment group	PBO	BARI 2 mg	BARI 4 mg	PBO	BARI 2 mg	BARI 4 mg	PBO + TCS	BARI 2 mg + TCS	BARI 4 mg + TCS
N	249	123	125	244	123	123	109	109	111
ADSS Item 2 ≥ 2-point improvement, % responders[c,d]	12.8	11.4	32.7*	8.0	19.6	24.4*	30.6	61.5*	66.7*
Change in Skin Pain NRS, mean(SE)[b]	-0.84 (0.24)	-1.58 (0.29)	-1.93** (0.26)	-0.86 (0.26)	-2.61** (0.30)	-2.49** (0.28)	-2.06 (0.23)	-3.22* (0.22)	-3.73* (0.23)
Change in DLQI, mean(SE)[b]	-2.46 (0.57)	-4.30* (0.68)	-6.76* (0.60)	-3.35 (0.62)	-7.44* (0.71)	-7.56* (0.66)	-5.58 (0.61)	-7.50* (0.58)	-8.89* (0.58)
Change in HADS, mean(SE)[b]	-1.22 (0.48)	-3.22* (0.58)	-3.56* (0.52)	-1.25 (0.57)	-2.82 (0.66)	-3.71* (0.62)	-3.18 (0.56)	-4.75* (0.54)	-5.12* (0.54)

BARI = Baricitinib; PBO = Placebo

* statistically significant vs placebo without adjustment for multiplicity; ** statistically significant vs placebo with adjustment for multiplicity.

[a] Full analysis set (FAS) including all randomised patients.

[b] Results shown are LS mean change from baseline (SE). Data collected after rescue therapy or after permanent study drug discontinuation were considered missing. LS means are from Mixed Model with Repeated Measures (MMRM) analyses.

[c] ADSS Item 2: Number of night time awakenings due to itch.

[d] Nonresponder imputation: patients who received rescue treatment or with missing data were considered as nonresponders. Results shown in subset of patients eligible for assessment (patients with ADSS Item 2 ≥ 2 at baseline).

Clinical Response in Patients with experience with or a Contra-Indication to Ciclosporin Treatment (BREEZE-AD4 study)

A total of 463 patients were enrolled, who had either failed (n = 173), or had an intolerance (n = 75), or contraindication (n = 126) to oral ciclosporin. The primary endpoint was the proportion of patients achieving EASI-75 at week 16. The primary and some of the most important secondary endpoints at week 16 are summarised in Table 8.

Table 8: Efficacy of baricitinib in combination with TCS[a] at week 16 in BREEZE-AD4 (FAS)[b]

Study	**BREEZE- AD4**		
Treatment group	PBO[a]	BARI 2 mg[a]	BARI 4 mg[a]
N	93	185	92
EASI-75, % responders[c]	17.2	27.6	31.5**
IGA 0 or 1, % responders[c, e]	9.7	15.1	21.7*
Itch NRS (≥ 4 point improvement), % responders[c, f]	8.2	22.9*	38.2**
Change in DLQI mean (SE)[d]	-4.95 (0.752)	-6.57 (0.494)	-7.95* (0.705)

BARI = Baricitinib; PBO = Placebo

* statistically significant vs placebo without adjustment for multiplicity; ** statistically significant vs placebo with adjustment for multiplicity.

[a] All patients were on concomitant topical corticosteroids therapy and patients were permitted to use topical calcineurin inhibitors.

[b] Full analysis set (FAS) includes all randomised patients.

[c] Non-Responder Imputation: Patients who received rescue treatment or with missing data were considered as non-responders.

[d] Data collected after rescue therapy or after permanent study drug discontinuation were considered missing. LS means are from Mixed Model with Repeated Measures (MMRM) analyses.

[e] Responder was defined as a patient with IGA 0 or 1 (“clear” or “almost clear”) with a reduction of ≥ 2 points on 0-4 IGA scale.

[f] Results shown in subset of patients eligible for assessment (patients with itch NRS ≥ 4 at baseline).

5.2 Pharmacokinetic properties

Following oral administration of baricitinib, a dose-proportional increase in systemic exposure was observed in the therapeutic dose range. The PK of baricitinib is linear with respect to time.

Absorption

Following oral administration, baricitinib is rapidly absorbed with a median t_{max} of approximately 1 hour (range 0.5 - 3.0h) and an absolute bioavailability of approximately 79% (CV = 3.94%). Food intake led to a decreased exposure by up to 14%, a decrease in C_{max} by up to 18% and delayed t_{max} by 0.5 hours. Administration with meals was not associated with a clinically relevant effect on exposure.

Distribution

Mean volume of distribution following intravenous infusion administration was 76L, indicating distribution of baricitinib into tissues. Baricitinib is approximately 50% bound to plasma proteins.

Biotransformation

Baricitinib metabolism is mediated by CYP3A4, with less than 10% of the dose identified as undergoing biotransformation. No metabolites were quantifiable in plasma. In a clinical pharmacology study, baricitinib was excreted predominately as the unchanged active substance in urine (69%) and faeces (15%) and only 4 minor oxidative metabolites were identified (3 in urine; 1 in faeces) constituting approximately 5% and 1% of the dose, respectively. *In vitro*, baricitinib is a substrate for CYP3A4, OAT3, Pgp, BCRP and MATE2-K, and may be a clinically relevant inhibitor of the transporter OCT1 (see section 4.5). Baricitinib is not an inhibitor of the transporters OAT1, OAT2, OAT3, OCT2, OATP1B1, OATP1B3, BCRP, MATE1 and MATE2-K at clinically relevant concentrations.

Elimination

Renal elimination is the principal mechanism for baricitinib's clearance through glomerular filtration and active secretion via OAT3, Pgp, BCRP and MATE2-K. In a clinical

pharmacology study, approximately 75% of the administered dose was eliminated in the urine, while about 20% of the dose was eliminated in the faeces.

Mean apparent clearance (CL/F) and half-life in patients with rheumatoid arthritis was 9.42 L/hr (CV = 34.3%) and 12.5hrs (CV = 27.4%), respectively. C_{max} and AUC at steady state are 1.4- and 2.0–fold higher, respectively, in subjects with rheumatoid arthritis compared to healthy subjects.

Mean apparent clearance (CL/F) and half-life in patients with atopic dermatitis was 11.2 L/hr (CV = 33.0%) and 12.9 hrs (CV = 36.0%), respectively. Cmax and AUC at steady state in patients with atopic dermatitis are 0.8 fold those seen in rheumatoid arthritis.

Renal Impairment

Renal function was found to significantly affect baricitinib exposure. The mean ratios of AUC in patients with mild and moderate renal impairment to patients with normal renal function are 1.41 (90% CI: 1.15-1.74) and 2.22 (90% CI: 1.81-2.73), respectively. The mean ratios of C_{max} in patients with mild and moderate renal impairment to patients with normal renal function are 1.16 (90% CI: 0.92-1.45) and 1.46 (90% CI: 1.17-1.83), respectively. See section 4.2 for dose recommendations.

Hepatic Impairment

There was no clinically relevant effect on the PK of baricitinib in patients with mild or moderate hepatic impairment. The use of baricitinib has not been studied in patients with severe hepatic impairment.

Elderly

Age ≥ 65 years or ≥ 75 years has no effect on baricitinib exposure (C_{max} and AUC).

Paediatric population

The safety, efficacy and pharmacokinetics of baricitinib have not yet been established in a paediatric population (see section 4.2).

Other intrinsic factors

Body weight, sex, race, and ethnicity did not have a clinically relevant effect on the PK of baricitinib. The mean effects of intrinsic factors on PK parameters (AUC and C_{max}) were generally within the inter-subject PK variability of baricitinib. Therefore, no dose adjustment is needed based on these patient factors.

5.3 Preclinical safety data

Non-clinical data reveal no special hazard for humans based on conventional studies of safety pharmacology, genotoxicity and carcinogenic potential.

Decreases in lymphocytes, eosinophils and basophils as well as lymphoid depletion in organs/tissues of the immune system were observed in mice, rats and dogs. Opportunistic infections related to demodicosis (mange) were observed in dogs at exposures approximately 7 times the human exposure. Decreases in red blood cell parameters were observed in mice, rats and dogs at exposures approximately 6 to 36 times the human exposure. Degeneration of the sternal growth plate was observed in some dogs, at low incidence and also in control animals, but with a dose-effect relationship regarding severity. At present it is not known whether this is clinically relevant.

In rat and rabbit reproductive toxicology studies, baricitinib was shown to reduce foetal growth/weight and produce skeletal malformations (at exposures of approximately 10 and 39 times the human exposure, respectively). No adverse foetal effects were observed at exposures 2 times the human exposure based on AUC.

In a combined male/female rat fertility study, baricitinib decreased overall mating performance (decreased fertility and conception indices). In female rats there were decreased numbers of corpora lutea and implantation sites, increased pre-implantation loss, and/or adverse effects on intrauterine survival of the embryos. Since there were no effects on spermatogenesis (as assessed by histopathology) or semen/sperm endpoints in male rats, the decreased overall mating performance was likely the result of these female effects.

Baricitinib was detected in the milk of lactating rats. In a pre- and postnatal development study, decreased pup weights and decreased postnatal survival were observed at exposures 4 and 21 times, respectively, the human exposure.

6. PHARMACEUTICAL PARTICULARS

6.1 List of excipients

Tablet cores

Croscarmellose sodium, magnesium stearate, mannitol, microcrystalline cellulose.

Film coating

Ferric oxide (E172), lecithin (soya) (E322), macrogol, poly (vinyl alcohol), talc, titanium dioxide (E171).

6.2 Incompatibilities

Not applicable.

6.3 Special precautions for storage

Do not store above 30° C.

6.4 Nature and contents of container

Blister strip cold form aluminium foil sealed with aluminium foil lidding, in carton of 7 and 28 film-coated tablets.

Not all pack sizes may be marketed.

6.5 Special precautions for disposal

No special requirements for disposal.

7. PRODUCT OWNER

Eli Lilly and Company, Indianapolis, IN 46285, USA

Date of revision of text: 14 Oct 2022