

SUMMARY OF PRODUCT CHARACTERISTICS

1 NAME OF THE MEDICINAL PRODUCT

Aimovig[®] 70 mg solution for injection in pre-filled pen

2 QUALITATIVE AND QUANTITATIVE COMPOSITION

Each pre-filled pen contains 70 mg erenumab.

Erenumab is a fully human IgG2 monoclonal antibody produced using recombinant DNA technology in Chinese hamster ovary (CHO) cells.

For the full list of excipients, see section 6.1.

3 PHARMACEUTICAL FORM

Solution for injection (injection)

The solution is clear to opalescent, colourless to light yellow.

4 CLINICAL PARTICULARS

4.1 Therapeutic indications

Aimovig is indicated for prophylaxis of migraine in adults who have at least 4 migraine days per month.

4.2 Posology and method of administration

Treatment should be initiated by physicians experienced in the diagnosis and treatment of migraine.

Posology

Treatment is intended for patients with at least 4 migraine days per month when initiating treatment with erenumab.

The recommended dose is 70 mg erenumab every 4 weeks. Some patients may benefit from a dose of 140 mg every 4 weeks (see section 5.1).

Each 140 mg dose is given either as one subcutaneous injection of 140 mg or as two subcutaneous injections of 70 mg.

Clinical studies have demonstrated that the majority of patients responding to therapy showed clinical benefit within 3 months. Consideration should be given to discontinuing treatment in patients who have shown no response after 3 months of treatment. Evaluation of the need to continue treatment is recommended regularly thereafter.

Special populations

Elderly (aged 65 years and over)

Aimovig has not been studied in elderly patients. No dose adjustment is required as the pharmacokinetics of erenumab are not affected by age.

Renal impairment / hepatic impairment

No dose adjustment is necessary in patients with mild to moderate renal impairment or hepatic impairment (see section 5.2).

Paediatric population

The safety and efficacy of Aimovig in children below the age of 18 years have not yet been established. No data are available.

Method of administration

Aimovig is for subcutaneous use.

Aimovig is intended for patient self-administration after proper training. The injections can also be given by another individual who has been appropriately instructed. The injection can be administered into the abdomen, thigh or into the outer area of the upper arm (the arm should be used only if the injection is being given by a

person other than the patient; see section 5.2). Injection sites should be rotated and injections should not be given into areas where the skin is tender, bruised, red or hard.

Pre-filled pen

The entire contents of the Aimovig pre-filled pen should be injected. Each pre-filled pen is for single use only and designed to deliver the entire contents with no residual content remaining.

Comprehensive instructions for administration are given in the instructions for use in the package leaflet.

4.3 Contraindications

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

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.

Cardiovascular effect

Patients with certain major cardiovascular diseases were excluded from clinical studies (see section 5.1). No safety data are available in these patients.

Hypersensitivity reactions

Serious hypersensitivity reactions, including rash, angioedema, and anaphylactic reactions, have been reported with erenumab in post-marketing experience. These reactions may occur within minutes, although some may occur more than one week after treatment. In that context, patients should be warned about the symptoms associated with hypersensitivity reactions. If a serious or severe hypersensitivity reaction occurs, appropriate therapy should be initiated and treatment with erenumab should be discontinued (see section 4.3).

Constipation

Constipation is a common adverse reaction of erenumab and is usually mild or

moderate in intensity. In a majority of the cases, the onset was reported after the first dose of erenumab; however patients have also experienced constipation later on in the treatment. In most cases constipation resolved within three months. In the post-marketing setting, constipation with serious complications has been reported with erenumab. In some of these cases hospitalisation was required, including cases where surgery was necessary. History of constipation or the concurrent use of medicinal products associated with decreased gastrointestinal motility may increase the risk for more severe constipation and the potential for constipation-related complications. Patients should be warned about the risk of constipation and advised to seek medical attention in case constipation does not resolve or worsens. Patients should seek medical attention immediately if they develop severe constipation. Constipation should be managed promptly as clinically appropriate. For severe constipation, discontinuation of treatment should be considered.

Sodium content

This medicinal product contains less than 1 mmol sodium (23 mg) per dose, that is to say essentially “sodium-free”.

Polysorbate 80 content

This medicinal product contains 0.1 mg of polysorbate 80 in each ml which is equivalent to 0.004 mg/kg.

4.5 Interaction with other medicinal products and other forms of interaction

No effect on exposure of co-administered medicinal products is expected based on the metabolic pathways of monoclonal antibodies. No interaction with oral contraceptives (ethinyl estradiol/norgestimate) or sumatriptan was observed in studies with healthy volunteers.

4.6 Fertility, pregnancy and lactation

Pregnancy

There are a limited amount of data from the use of erenumab in pregnant women. Animal studies do not indicate direct or indirect harmful effects with respect to reproductive toxicity (see section 5.3). As a precautionary measure, it is preferable to avoid the use of Aimovig during pregnancy.

Breast-feeding

It is unknown whether erenumab is excreted in human milk. Human IgGs are known to be excreted in breast milk during the first few days after birth, which is decreasing

to low concentrations soon afterwards; consequently, a risk to the breast-fed infant cannot be excluded during this short period. Afterwards, use of Aimovig could be considered during breast-feeding only if clinically needed.

Fertility

Animal studies showed no impact on female and male fertility (see section 5.3).

4.7 Effects on ability to drive and use machines

Aimovig is expected to have no or negligible influence on the ability to drive and use machines.

4.8 Undesirable effects

Summary of the safety profile

A total of over 2,500 patients (more than 2,600 patient years) have been treated with Aimovig in registration studies. Of these, more than 1,300 patients were exposed for at least 12 months and 218 patients were exposed for 5 years. The overall safety profile of Aimovig remained consistent for 5 years of long-term open-label treatment.

The reported adverse drug reactions for 70 mg and 140 mg were injection site reactions (5.6%/4.5%), constipation (1.3%/3.2%), muscle spasms (0.1%/2.0%) and pruritus (0.7%/1.8%). Most of the reactions were mild or moderate in severity. Less than 2% of patients in these studies discontinued due to adverse reactions.

Tabulated list of adverse reactions

Table 1 lists all adverse drug reactions that occurred in Aimovig-treated patients during the 12-week placebo-controlled periods of the studies, as well as in the post-marketing setting. Within each system organ class, the ADRs are ranked by frequency, with the most frequent reactions first. Within each frequency grouping, adverse drug reactions are presented in order of decreasing seriousness. In addition, the corresponding frequency category for each adverse drug reaction is based on the following convention: very common ($\geq 1/10$); common ($\geq 1/100$ to $< 1/10$); uncommon ($\geq 1/1,000$ to $< 1/100$); rare ($\geq 1/10,000$ to $< 1/1,000$); very rare ($< 1/10,000$); not known (cannot be estimated from the available data).

Table 1List of adverse reactions

System Organ Class	Adverse reaction	Frequency category
Immune system disorders	Hypersensitivity reactions ^a including anaphylaxis, angioedema, rash, swelling/oedema and urticaria	Common
Gastrointestinal disorders	Constipation	Common
	Oral sores ^b	Not known
Skin and subcutaneous tissue disorders	Pruritus ^c	Common
	Alopecia Rash ^d	Not known
Musculoskeletal and connective tissue disorders	Muscle spasms	Common
General disorders and administration site conditions	Injection site reactions ^a	Common
^a	See section “Description of selected adverse reactions”	
^b	Oral sores includes preferred terms of stomatitis, mouth ulceration, oral mucosal blistering.	
^c	Pruritus includes preferred terms of generalised pruritus, pruritus and pruritic rash.	
^d	Rash includes preferred terms of rash papular, exfoliative rash, rash erythematous, urticaria, blister.	

Description of selected adverse reactions

Injection site reactions

In the integrated 12-week placebo-controlled phase of the studies, injection site reactions were mild and mostly transient. There was one case of discontinuation in a patient receiving the 70 mg dose due to injection site rash. The most frequent injection site reactions were localised pain, erythema and pruritus. Injection site pain typically subsided within 1 hour after administration.

Cutaneous and hypersensitivity reactions

In the integrated 12-week placebo-controlled phase of the studies, non-serious cases of rash, pruritus and swelling/oedema were observed, which in the majority of cases were mild and did not lead to treatment discontinuation.

In the post-marketing setting, cases of anaphylaxis and angioedema were observed.

Immunogenicity

During the double-blind treatment phase of the clinical studies, the incidence of anti-erenumab antibody development was 6.3% (56/884) among subjects receiving a 70 mg dose of erenumab (3 of whom had *in vitro* neutralising activity) and 2.6% (13/504) among subjects receiving the 140 mg dose of erenumab (none of whom had *in vitro* neutralising activity). In an open-label study with up to 256 weeks of treatment, the incidence of anti-erenumab antibody development was 11.0% (25/225) among patients who only received 70 mg or 140 mg of Aimovig throughout the entire study (2 of whom had *in vitro* neutralising activity). There was no impact of anti-erenumab antibody development on the efficacy or safety of erenumab.

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

4.9 Overdose

No cases of overdose have been reported in clinical studies.

Doses up to 280 mg have been administered subcutaneously in clinical studies with no evidence of dose-limiting toxicity.

In the event of an overdose, the patient should be treated symptomatically and supportive measures instituted as required.

5 PHARMACOLOGICAL PROPERTIES

5.1 Pharmacodynamic properties

Pharmacotherapeutic group: Analgesics, antimigraine preparations, ATC code: N02CD01

Mechanism of action

Erenumab is a human monoclonal antibody that binds to the calcitonin gene-related peptide (CGRP) receptor. The CGRP receptor is located at sites that are relevant to migraine pathophysiology, such as the trigeminal ganglion. Erenumab potently and specifically competes with the binding of CGRP and inhibits its function at the CGRP receptor, and has no significant activity against other calcitonin family of receptors.

CGRP is a neuropeptide that modulates nociceptive signalling and a vasodilator that has been associated with migraine pathophysiology. In contrast with other neuropeptides, CGRP levels have been shown to increase significantly during migraine and return to normal with headache relief. Intravenous infusion of CGRP induces migraine-like headache in patients.

Inhibition of the effects of CGRP could theoretically attenuate compensatory vasodilation in ischaemic-related conditions. A study evaluated the effect of a single intravenous dose of 140 mg Aimovig in subjects with stable angina under controlled exercise conditions. Aimovig showed similar exercise duration compared to placebo and did not aggravate myocardial ischaemia in these patients.

Clinical efficacy and safety

Erenumab was evaluated for prophylaxis of migraine in two pivotal studies across the migraine spectrum in chronic and episodic migraine. In both studies, the patients enrolled had

at least a 12-month history of migraine (with or without aura) according to the International Classification of Headache Disorders (ICHD-III) diagnostic criteria. Elderly patients (>65 years), patients with opioid overuse in study in chronic migraine, patients with medication overuse in study in episodic migraine, and also patients with pre-existing myocardial infarction, stroke, transient ischaemic attacks, unstable angina, coronary artery bypass surgery or other re-vascularisation procedures within 12 months prior to screening were excluded. Patients with poorly controlled hypertension or BMI >40 were excluded from Study 1.

Chronic migraine

Study 1

Aimovig (erenumab) was evaluated as monotherapy for prophylaxis of chronic migraine in a randomised, multicentre, 12-week, placebo-controlled, double-blind study in patients suffering from migraine with or without aura (≥ 15 headache days per month with ≥ 8 migraine days per month).

667 patients were randomised in a 3:2:2 ratio to receive placebo (n = 286) or 70 mg (n = 191) or 140 mg (n = 190) erenumab, stratified by the presence of acute medication overuse (present in 41% of overall patients). Patients were allowed to use acute headache treatments during the study.

Demographics and baseline disease characteristics were balanced and comparable between study arms. Patients had a median age of 43 years, 83% were female and 94% were white. The mean migraine frequency at baseline was approximately 18 migraine days per month. Overall, 68% had failed one or more previous prophylactic pharmacotherapies due to lack of efficacy or poor tolerability, and 49% had failed two or more previous prophylactic pharmacotherapies due to lack of efficacy or poor tolerability. A total of 366 (96%) patients in the erenumab arms and 265 (93%) patients in the placebo arm completed the study (i.e. completed Week 12 assessment).

Reduction in mean monthly migraine days from placebo was observed in a monthly analysis from Month 1 and in a follow-up weekly analysis an onset of erenumab effect was seen from the first week of administration.

Figure 1 Change from baseline in monthly migraine days over time in Study 1 (including primary endpoint at Month 3)

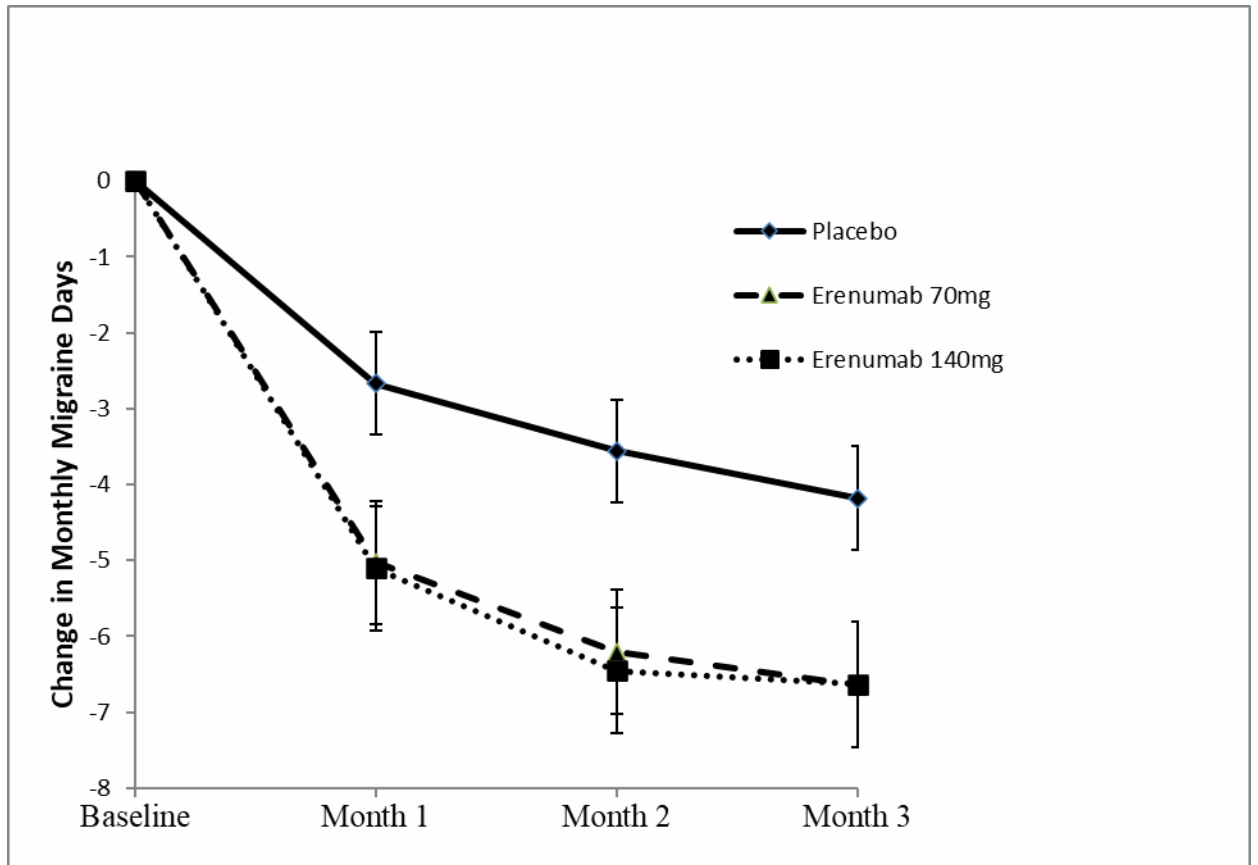


Table 2 Change from baseline in efficacy and patient-reported outcomes at Week 12 in Study 1

	Aimovig (erenumab) 140 mg (n = 187)	Aimovig (erenumab) 70 mg (n = 188)	Placebo (n = 281)	Treatment difference (95% CI)	p-value
Efficacy outcomes					
MMD					
Mean change (95% CI)	-6.6 (-7.5, -5.8)	-6.6 (-7.5; -5.8)	-4.2 (-4.9, -3.5)	Both -2.5 (-3.5, -1.4)	Both <0.001
Baseline (SD)	17.8 (4.7)	17.9 (4.4)	18.2 (4.7)		
≥50% MMD responders Percentage [%]	41.2%	39.9%	23.5%	n/a	Both <0.001 ^a d
≥75% MMD responders Percentage [%]	20.9%	17.0%	7.8%	n/a	n/a ^b
Monthly acute migraine- specific medication days					
Mean change (95% CI)	-4.1 (-4.7, -3.6)	-3.5 (-4.0, -2.9)	-1.6 (-2.1, -1.1)	70 mg: -1.9 (-2.6, -1.1) 140 mg: -2.6 (-3.3, -1.8)	Both <0.001 ^a
Baseline (SD)	9.7 (7.0)	8.8 (7.2)	9.5 (7.6)		
Patient-reported outcome measures					
HIT-6					
Mean change ^c (95% CI)	-5.6 (-6.5, -4.6)	-5.6 (-6.5, -4.6)	-3.1 (-3.9, -2.3)	70 mg: -2.5 (-3.7, -1.2) 140 mg: -2.5 (-3.7, -1.2)	n/a ^b
MIDAS total					
Mean change ^c (95% CI)	-19.8 (-25.6, -14.0)	-19.4 (-25.2, -13.6)	-7.5 (-12.4, -2.7)	70 mg: -11.9 (-19.3, -4.4) 140 mg: -12.2 (-19.7, -4.8)	n/a ^b
CI = confidence interval; MMD = monthly migraine days; HIT-6 = Headache Impact Test; MIDAS = Migraine Disability Assessment; n/a = not applicable.					
^a For secondary endpoints, all p-values are reported as unadjusted p-values and are statistically significant after adjustment for multiple comparisons.					
^b For exploratory endpoints, no p-value is presented.					
^c For HIT-6: Change and reduction from baseline were evaluated in the last 4 weeks of the 12-week double-blind treatment phase. For MIDAS: Change and reduction from baseline were evaluated over 12 weeks. For data collection a recall period of 3 months has been used.					
^d p value was calculated based on the odds ratios.					

In patients failing one or more prophylactic pharmacotherapies the treatment difference for the reduction of monthly migraine days (MMD) observed between erenumab 140 mg and placebo was -3.3 days (95% CI: -4.6, -2.1) and between erenumab 70 mg and placebo -2.5 days (95% CI: -3.8, -1.2). In patients failing two or more prophylactic pharmacotherapies the treatment difference was -4.3 days (95% CI: -5.8; -2.8) between 140 mg and placebo and -2.7 days (95% CI: -4.2, -1.2) between 70 mg and placebo. There was also a higher proportion of subjects treated with erenumab who achieved at least 50% reduction of MMD compared to placebo in the patients failing one or more prophylactic pharmacotherapies (40.8% for 140 mg, 34.7% for 70 mg versus 17.3% for placebo), with an odds ratio of 3.3 (95% CI: 2.0, 5.5) for 140 mg and 2.6 (95% CI: 1.6, 4.5) for 70 mg. In patients failing two or more

prophylactic pharmacotherapies the proportion was 41.3% for 140 mg and 35.6% for 70 mg versus 14.2% for placebo with an odds ratio of 4.2 (95% CI: 2.2, 7.9) and 3.5 (95% CI: 1.8, 6.6), respectively.

Approximately 41% of patients in the study had medication overuse. The treatment difference observed between erenumab 140 mg and placebo and between erenumab 70 mg and placebo for the reduction of MMD in these patients was -3.1 days (95% CI: -4.8, -1.4) in both cases, and for the reduction of acute migraine-specific medication days was -2.8 (95% CI: -4.2, -1.4) for 140 mg and -3.3 (95% CI: -4.7, -1.9) for 70 mg. There was a higher proportion of patients in the erenumab group who achieved at least a 50% reduction of MMD compared to placebo (34.6% for 140 mg, 36.4% for 70 mg versus 17.7% for placebo), with an odds ratio of 2.5 (95% CI: 1.3, 4.9) and 2.7 (95% CI: 1.4, 5.2), respectively.

Efficacy was sustained for up to 1 year in the open-label extension of Study 1 in which patients received 70 mg and/or 140 mg erenumab. 74.1% of patients completed the 52-week extension. Pooled across the two doses, a reduction of -9.3 MMD was observed after 52 weeks relative to core study baseline. 59% of patients completing the study achieved a 50% response in the last month of the study.

Episodic migraine

Study 2

Erenumab was evaluated for prophylaxis of episodic migraine in a randomised, multicentre, 24-week, placebo-controlled, double-blind study in patients suffering from migraine with or without aura (4-14 migraine days per month).

955 patients were randomised in a 1:1:1 ratio to receive 140 mg (n = 319) or 70 mg (n = 317) erenumab or placebo (n = 319). Patients were allowed to use acute headache treatments during the study.

Demographics and baseline disease characteristics were balanced and comparable between study arms. Patients had a median age of 42 years, 85% were female and 89% were white. The mean migraine frequency at baseline was approximately 8 migraine days per month. Overall, 39% had failed one or more previous prophylactic pharmacotherapies due to lack of efficacy or poor tolerability. A total of 294 patients (92%) for 140 mg, 287 (91%) patients for 70 mg and 284 patients (89%) in the placebo arm completed the double-blind phase.

Patients treated with erenumab had a clinically relevant and statistically significant reduction from baseline in the frequency of migraine days from Months 4 to 6 (Figure 2) compared to patients receiving placebo. Differences from placebo were observed from Month 1 onwards.

Figure 2 Change from baseline in monthly migraine days over time in Study 2 (including primary endpoint over Months 4, 5 and 6)

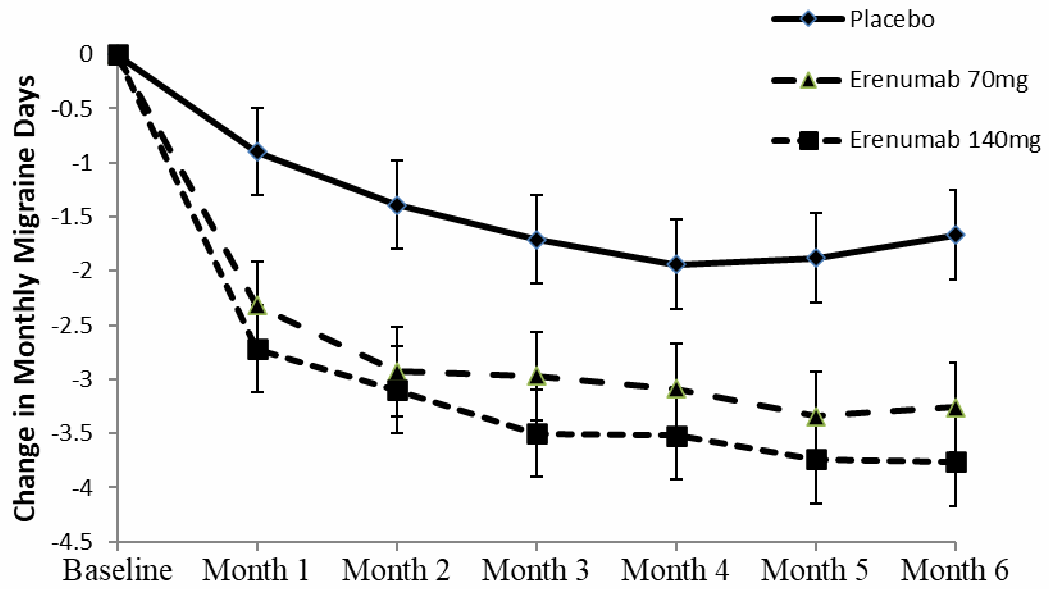


Table 3 Change from baseline in efficacy and patient-reported outcomes at Weeks 13-24 in Study 2

	Aimovig (erenumab) 140 mg (n = 318)	Aimovig (erenumab) 70 mg (n = 312)	Placebo (n = 316)	Treatment difference (95% CI)	p-value
Efficacy outcomes					
MMD					
Mean change (95% CI)	-3.7 (-4.0, -3.3)	-3.2 (-3.6, -2.9)	-1.8 (-2.2, -1.5)	70 mg: -1.4 (-1.9, -0.9) 140 mg: -1.9 (-2.3, -1.4)	Both <0.001 ^a
Baseline (SD)	8.3 (2.5)	8.3 (2.5)	8.2 (2.5)		
≥50% MMD responders					
Percentage [%]	50.0%	43.3%	26.6%	n/a	Both <0.001 ^{a, d}
≥75% MMD responders					
Percentage [%]	22.0%	20.8%	7.9%	n/a	n/a ^b
Monthly acute migraine- specific medication days					
Mean change (95% CI)	-1.6 (-1.8, -1.4)	-1.1 (-1.3, -0.9)	-0.2 (-0.4, 0.0)	70 mg: -0.9(-1.2, -0.6) 140 mg: -1.4 (-1.7, -1.1)	Both <0.001 ^a
Baseline (SD)	3.4 (3.5)	3.2 (3.4)	3.4 (3.4)		
Patient-reported outcome measures					
HIT-6					
Mean change ^c (95% CI)	-6.9 (-7.6, -6.3)	-6.7 (-7.4, -6.0)	-4.6 (-5.3, -4.0)	70 mg: -2.1 (-3.0, -1.1) 140 mg: -2.3 (-3.2, -1.3)	n/a ^b
MIDAS (modified) total					
Mean change ^c (95% CI)	-7.5 (-8.3, -6.6)	-6.7 (-7.6, -5.9)	-4.6 (-5.5, -3.8)	70 mg: -2.1 (-3.3, -0.9) 140 mg: -2.8 (-4.0, -1.7)	n/a ^b
CI = confidence interval; MMD = monthly migraine days; HIT-6 = Headache Impact Test; MIDAS = Migraine Disability Assessment					
^a For the secondary endpoints, all p-values are reported as unadjusted p-values and are statistically significant after adjustment for multiple comparisons.					
^b For exploratory endpoints, no p-value was presented.					
^c For HIT-6: Change and reduction from baseline were evaluated in the last 4 weeks of the 12-week double-blind treatment phase. For MIDAS: Change and reduction from baseline were evaluated over 24 weeks. For data collection a recall period of 1 month has been used.					
^d p value is calculated based on the odds ratios.					

In patients failing one or more prophylactic pharmacotherapies the treatment difference for the reduction of MMD observed between erenumab 140 mg and placebo was -2.5 (95% CI: -3.4, -1.7) and between erenumab 70 mg and placebo -2.0 (95% CI: -2.8, -1.2). There was also a higher proportion of subjects treated with erenumab who achieved at least 50% reduction of MMD compared to placebo (39.7% for 140 mg and 38.6% for 70 mg, with an odds ratio of 3.1 [95% CI: 1.7, 5.5] and 2.9 [95% CI: 1.6, 5.3], respectively).

Efficacy was sustained up to 1 year in the active re-randomisation part of Study 2. Patients were re-randomised in the active treatment phase (ATP) to 70 mg or 140 mg erenumab. 79.8% completed the entire study out to 52 weeks. The reduction in monthly migraine days from baseline to Week 52 was -4.22 in the 70 mg ATP group and -4.64 days in the 140 mg ATP group. At Week 52, the proportion of subjects who achieved a $\geq 50\%$ reduction in MMD from baseline was 61.0% in the 70 mg ATP and 64.9% in the 140 mg ATP group.

Long-term follow-up study

Following a placebo-controlled study, 383 patients continued in an open-label treatment phase over 5 years initially receiving erenumab 70 mg (median exposure: 2.0 years), of which 250 patients increased their dose to 140 mg (median exposure: 2.7 years). 214 completed the open-label treatment phase of 5 years. Of the 383 patients, 168 (43.9%) discontinued with the most common reasons being patient request (84 patients; 21.9%), adverse events (19 patients; 5.0%), lost to follow-up (14 patients; 3.7%) and lack of efficacy (12 patients; 3.1%). The results indicate that efficacy was sustained for up to 5 years in the open-label treatment phase of the study.

Study 3: Study in patients with previous failure or non-suitability of 2 to 4 migraine prophylactic pharmacotherapies

246 adult patients with episodic migraine were randomised in a 1:1 ratio to receive either erenumab 140 mg (n = 121) or placebo (n = 125) for 12 weeks. Three patients (erenumab: 2, placebo: 1) were excluded from the primary analysis due to not having received study treatment. During the last 4 weeks of the double-blind treatment, 30.3% (36/119) of patients in the erenumab group achieved at least a 50% reduction from baseline in MMD compared to 13.7% (17/124) in the placebo group (p = 0.002).

Study 4: Study to assess tolerability (primary endpoint) and efficacy versus topiramate

777 adult patients with episodic or chronic migraine were randomised in a 1:1 ratio to receive either erenumab (70 mg or 140 mg, n = 389) or topiramate 50 to 100 mg (n=388) for 24 weeks (double-blind treatment phase). Safety and efficacy data were pooled for patients receiving the erenumab 70 mg and 140 mg doses and compared with that for patients receiving topiramate.

Erenumab demonstrated superior tolerability versus topiramate based on the rate of discontinuation of treatment due to adverse events (erenumab: 10.5%, topiramate: 38.9%; p <0.001; primary endpoint). Additionally, 55.4% of patients in the erenumab group achieved at least a 50% reduction from baseline in MMD during the last 3 months of the study, compared with 31.2% in the topiramate group (p <0.001).

Paediatric population

The European Medicines Agency has deferred the obligation to submit the results of studies with Aimovig in prevention of migraine headaches in one or more subsets of the paediatric population (see section 4.2 for information on paediatric use).

5.2 Pharmacokinetic properties

Erenumab exhibits non-linear kinetics as a result of binding to the CGRP-R receptor. However, at therapeutically relevant doses, the pharmacokinetics of erenumab following subcutaneous dosing every 4 weeks are predominantly linear due to saturation of binding to CGRP-R. Subcutaneous administration of a 140 mg once monthly dose and a 70 mg once monthly dose in healthy volunteers resulted in a C_{\max} mean (standard deviation [SD]) of 15.8 (4.8) $\mu\text{g/ml}$ and 6.1 (2.1) $\mu\text{g/ml}$, respectively,

and AUC_{last} mean (SD) of 505 (139) day*µg/ml and 159 (58) day*µg/ml, respectively.

Less than 2-fold accumulation was observed in trough serum concentrations following 140 mg doses administered subcutaneously every 4 weeks and serum trough concentrations approached steady state by 12 weeks of dosing.

Absorption

Following a single subcutaneous dose of 140 mg or 70 mg erenumab administered to healthy adults, median peak serum concentrations were attained in 4 to 6 days, and estimated absolute bioavailability was 82%.

Distribution

Following a single 140 mg intravenous dose, the mean (SD) volume of distribution during the terminal phase (V_z) was estimated to be 3.86 (0.77) l.

Biotransformation / Elimination

Two elimination phases were observed for erenumab. At low concentrations, the elimination is predominately through saturable binding to target (CGRP-R), while at higher concentrations the elimination of erenumab is largely through a non-specific proteolytic pathway. Throughout the dosing period erenumab is predominantly eliminated via a non-specific proteolytic pathway with the effective half-life of 28 days.

Special populations

Patients with renal impairment

Patients with severe renal impairment (eGFR <30 ml/min/1.73 m²) have not been studied. Population pharmacokinetic analysis of integrated data from the Aimovig clinical studies did not reveal a difference in the pharmacokinetics of erenumab in patients with mild or moderate renal impairment relative to those with normal renal function (see section 4.2).

Patients with hepatic impairment

No studies have been performed in patients with hepatic impairment. Erenumab, as a human monoclonal antibody, is not metabolised by cytochrome P450 enzymes and hepatic clearance is not a major clearance pathway for erenumab (see section 4.2).

5.3 Preclinical safety data

Non-clinical data reveal no special hazard for humans based on conventional studies of safety pharmacology, repeated-dose toxicity, toxicity to reproduction and development.

Carcinogenicity studies have not been conducted with erenumab. Erenumab is not pharmacologically active in rodents. It has biological activity in cynomolgus monkeys, but this species is not an appropriate model for evaluation of tumorigenic risk. The mutagenic potential of erenumab has not been evaluated; however, monoclonal antibodies are not expected to alter DNA or chromosomes.

In repeated-dose toxicology studies there were no adverse effects in sexually mature monkeys dosed up to 150 mg/kg subcutaneously twice weekly for up to 6 months at systemic exposures up to 123-fold and 246-fold higher than the clinical dose of 140 mg and 70 mg, respectively, every 4 weeks, based on serum AUC. There were also no adverse effects on surrogate markers of fertility (anatomical pathology or histopathology changes in reproductive organs) in these studies.

In a reproduction study in cynomolgus monkeys there were no effects on pregnancy, embryo-foetal or post-natal development (up to 6 months of age) when erenumab was dosed throughout pregnancy at exposure levels approximately 17-fold and 34-fold higher than those achieved in patients receiving erenumab 140 mg and 70 mg, respectively, every 4 weeks dosing regimen based on AUC. Measurable erenumab serum concentrations were observed in the infant monkeys at birth, confirming that erenumab, like other IgG antibodies, crosses the placental barrier.

6 PHARMACEUTICAL PARTICULARS

6.1 List of excipients

Sucrose

Polysorbate 80

Sodium hydroxide (for pH adjustment)

Glacial acetic acid

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

3 years

6.4 Special precautions for storage

Pre-filled syringe

Store in a refrigerator (2°C - 8°C). Do not freeze.

Keep the pre-filled syringe in the outer carton in order to protect from light.

After removal from the refrigerator, Aimovig must be used within 7 days when stored at room temperature (up to 25°C), or discarded. If it is stored at a higher temperature or for a longer period it must be discarded.

Pre-filled pen

Store in a refrigerator (2°C - 8°C). Do not freeze.

Keep the pre-filled pen in the outer carton in order to protect from light.

After removal from the refrigerator, Aimovig must be used within 7 days when stored at room temperature (up to 25°C), or discarded. If it is stored at a higher temperature or for a longer period it must be discarded.

6.5 Nature and contents of container

Pre-filled pen

Aimovig is supplied in a pre-filled pen (1 ml, Type 1 glass) with a stainless steel needle and a needle cover .

Aimovig is available in packs containing 1 pre-filled pen and in multipacks containing 3 (3x1) pre-filled pens.

Not all pack sizes may be marketed.

6.6 Special precautions for disposal

Before administration, the solution should be inspected visually. The solution should not be injected if it is cloudy, distinctly yellow or contains flakes or particles.

To avoid discomfort at the site of injection, the pre-filled pen(s) should be left to stand at room temperature (up to 25°C) for at least 30 minutes before injecting. It

should also be protected from direct sunlight. The entire contents of the pre-filled pen(s) must be injected. The pen(s) must not be warmed by using a heat source such as hot water or microwave and must not be shaken.

Any unused medicinal product or waste material should be disposed of in accordance with local requirements.

7 MARKETING AUTHORISATION HOLDER

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