

## NEW ZEALAND DATA SHEET

### 1. PRODUCT NAME

Ocrevus 300 mg in 10 mL concentrate for solution for infusion.

*ocrelizumab (rch)*

CAS: 637334-45-3

### 2. QUALITATIVE AND QUANTITATIVE COMPOSITION

Ocrevus is supplied in a single-dose vial containing 10 mL of preservative-free concentrate solution for infusion. Each vial contains 300 mg of ocrelizumab (30 mg/mL).

Ocrevus (ocrelizumab) is a recombinant humanised monoclonal antibody (IgG1 subtype) that selectively targets CD20-expressing B-cells.

### 3. PHARMACEUTICAL FORM

Concentrate for solution for infusion.

Clear or slightly opalescent, and colourless to pale brown solution.

### 4. CLINICAL PARTICULARS

#### 4.1 Therapeutic Indications

Ocrevus is indicated for the treatment of adult patients with relapsing forms of multiple sclerosis (RMS) to suppress relapses and disease progression (clinical and subclinical disease activity).

Ocrevus is indicated for the treatment of adult patients with primary progressive multiple sclerosis (PPMS) to delay disease progression and reduce deterioration in walking speed.

#### 4.2 Dose and Method of Administration

##### *General*

Ocrevus is administered as an IV infusion through a dedicated line under the close supervision of an experienced healthcare professional with access to appropriate medical support to manage severe reactions such as serious IRRs. Ocrevus infusions should not be administered as an intravenous push or bolus. Use isotonic 0.9% sodium chloride solution as the infusion vehicle. In the event an IV infusion cannot be completed the same day, the remaining liquid in the infusion bag must be discarded (see section 6.3).

Observe the patient for at least one hour after the completion of the infusion (see section 4.4).

In order to improve traceability of biological medicinal products, the trade name and the batch number of the administered product should be clearly recorded or stated in the patient medical record.

Substitution by any other biological medicinal product approved in the indication requires the consent of the prescribing physician.

***Premedication for Infusion Related Reactions (IRR)***

Premedicate with 100 mg IV methylprednisolone (or an equivalent) approximately 30 minutes prior to each Ocrevus infusion (see section 4.4), and with an antihistaminic drug approximately 30-60 minutes before each infusion of Ocrevus to reduce the frequency and severity of IRRs.

The addition of an antipyretic (e.g. paracetamol) may also be considered approximately 30-60 minutes before each infusion of Ocrevus.

***Dosing***

Ocrevus is administered by IV infusion as a 600 mg dose every 6 months.

***Initial Dose***

The initial 600 mg dose is administered as two separate IV infusions; one 300 mg infusion, followed by a second 300 mg infusion two weeks later (see Table 1).

***Subsequent Doses***

Subsequent doses of Ocrevus thereafter are administered as a single 600 mg IV infusion every 6 months (see Table 1). (A minimum interval of 5 months should be maintained between each dose of Ocrevus.)

**Table 1 Dose and Schedule of Ocrevus**

		<b>Quantity of Ocrevus to be administered*</b>	<b>Infusion Instructions</b>
<b>Initial Dose (600 mg) divided into 2 infusions</b>	Infusion 1	300 mg in 250 mL	<ul style="list-style-type: none"> <li>• Initiate the infusion at a rate of 30 mL/hr</li> <li>• Thereafter the rate can be increased in 30 mL/hr increments every 30 minutes to a maximum of 180 mL/hr</li> <li>• Each infusion should be given over approximately 2.5 hrs</li> </ul>
	Infusion 2 (2 weeks later)	300 mg in 250 mL	
<b>Subsequent Doses** (600 mg) once every 6 months</b>	Single infusion	600 mg in 500 mL	<ul style="list-style-type: none"> <li>• Initiate the infusion at a rate of 40 mL/hr</li> <li>• Thereafter the rate can be increased in 40 mL/hr increments every 30 minutes to a maximum of 200 mL/hr</li> <li>• Each infusion should be given over approximately 3.5 hrs</li> </ul>

\* Solutions of Ocrevus for IV infusion are prepared by dilution of the drug product into an infusion bag containing 0.9% sodium chloride, to a final drug concentration of approximately 1.2 mg/mL (see - *Instructions for dilution*)

\*\* The first single infusion should be administered 6 months after Infusion 1 of the Initial dose

### ***Delayed or Missed Doses***

If a planned infusion of Ocrevus is missed, it should be administered as soon as possible; do not wait until the next planned dose. The treatment interval for Ocrevus should be maintained between doses.

### ***Infusion Adjustments during Treatment***

No dose reductions of Ocrevus are recommended.

In case of IRRs during any infusion, see the following adjustments below. Additional information on IRRs can be found under section 4.4.

#### ***Life-threatening IRRs***

Immediately stop Ocrevus if there are signs of a life-threatening or disabling IRR during an infusion, such as acute hypersensitivity or acute respiratory distress syndrome. The patient should receive appropriate supportive treatment. Permanently discontinue Ocrevus in these patients.

#### ***Severe IRRs***

If a patient experiences a severe IRR or a complex of flushing, fever, and throat pain symptoms, the infusion should be interrupted immediately and the patient should receive symptomatic treatment. The infusion should be restarted only after all symptoms have resolved. The initial infusion rate at restart should be half the infusion rate at the time of onset of the reaction.

#### ***Mild to Moderate IRRs***

If a patient experiences a mild to moderate IRR (e.g. headache), the infusion rate should be reduced to half the rate at the onset of the event. This reduced rate should be maintained for at least 30 minutes. If tolerated, the infusion rate may then be increased according to the patient's initial infusion schedule.

See section 4.4 for a full description of the symptoms associated with IRRs.

### ***Dose Modifications in Special Populations***

***Children:*** The safety and efficacy of Ocrevus in children and adolescents below 18 years of age have not been established.

***Elderly:*** The safety and efficacy of Ocrevus in patients  $\geq 65$  years of age have not been studied.

***Renal Impairment:*** The safety and efficacy of Ocrevus in patients with renal impairment have not been formally studied. A change in dose is not expected to be required for patients with renal impairment (see section 5.2).

*Hepatic Impairment:* The safety and efficacy of Ocrevus in patients with hepatic impairment have not been formally studied. A change in dose is not expected to be required for patients with hepatic impairment (see section 5.2).

### ***Instructions for Dilution***

Ocrevus should be prepared by a healthcare professional using aseptic technique.

Ocrevus may contain fine translucent and/or reflective particles associated with enhanced opalescence. Do not use the solution if discoloured or if the solution contains discrete foreign particulate matter.

Ocrevus must be diluted before administration. Solutions of Ocrevus for IV administration are prepared by dilution into an infusion bag containing 0.9% sodium chloride (300 mg/250 mL or 600 mg/500 mL), to a final drug concentration of approximately 1.2 mg/mL.

### ***Instructions for Administration***

The diluted infusion solution must be administered using an infusion set with a 0.2 or 0.22 micron in-line filter.

Prior to the start of the IV infusion, the content of the infusion bag must be at room temperature to avoid an infusion reaction to the administration of the solution at low temperatures.

## **4.3 Contraindications**

Ocrevus is contraindicated in patients with a known hypersensitivity to ocrelizumab or any of the excipients.

## **4.4 Special Warnings and Precautions for Use**

### ***Infusion Related Reactions (IRR)***

Ocrevus is associated with IRRs, which may be related to cytokine release and/or other chemical mediators.

Symptoms of IRRs may occur during any infusion, but have been more frequently reported during the first infusion. IRRs can occur within 24 hours of the infusion. These reactions may present as pruritus, rash, urticarial, erythema, throat irritation, oropharyngeal pain, dyspnoea, pharyngeal or laryngeal oedema, flushing, hypotension, pyrexia, fatigue, headache, dizziness, nausea and tachycardia (see section 4.8). Patients treated with Ocrevus should be observed for at least one hour after the completion of the infusion for any symptom of IRR. Physicians should alert patients that IRRs can occur within 24 hours of infusion.

A hypersensitivity reaction could also occur (acute allergic reaction to drug). IRRs may be clinically indistinguishable from Type 1 (IgE-mediated) acute hypersensitivity reactions (see section 4.4).

For premedication to reduce the frequency and severity of IRRs see section 4.2.

### *Managing IRRs*

For patients experiencing life-threatening, severe or mild to moderate IRR symptoms see section 4.2.

Patients who experience severe pulmonary symptoms, such as bronchospasm or asthma exacerbation, must have their infusion interrupted immediately and permanently. After administering symptomatic treatment, monitor the patient until the pulmonary symptoms have resolved because initial improvement of clinical symptoms could be followed by deterioration. Hypotension as a symptom of IRR may occur during Ocrevus infusions. Therefore withholding of antihypertensive treatments should be considered for 12 hours prior to and throughout each Ocrevus infusion. Patients with a history of congestive heart failure (New York Heart Association III & IV) were not studied in the controlled clinical trials.

### *Hypersensitivity Reactions*

No hypersensitivity reactions to Ocrevus were reported in the controlled clinical trials.

Symptoms of a hypersensitivity reaction may be difficult to distinguish from IRRs. A hypersensitivity reaction may present during any infusion, although typically would not present during the first infusion. For subsequent infusions, more severe symptoms than previously experienced, or new severe symptoms, should prompt consideration of a potential hypersensitivity reaction. If a hypersensitivity reaction is suspected during infusion, the infusion must be stopped immediately and permanently. Patients with known IgE-mediated hypersensitivity to Ocrevus must not be treated (see section 4.3).

### *Infections*

Delay Ocrevus administration in patients with an active infection until the infection is resolved.

### *Progressive Multifocal Leukoencephalopathy (PML)*

No cases of PML were identified in the Ocrevus clinical trials. John Cunningham (JC) virus infection resulting in PML has been observed in patients treated with anti-CD20 antibodies and other MS therapies, and is associated with risk factors (e.g. patient population, polytherapy with immunosuppressants). However, a risk of PML cannot be excluded. Physicians should be vigilant for early signs and symptoms of PML, which can include any new onset, or worsening of neurological signs or symptoms as these can be similar to an MS relapse.

If PML is suspected, withhold dosing with Ocrevus. Evaluation of PML, including MRI scan preferably with contrast (compared with pre-treatment MRI), confirmatory cerebrospinal fluid (CSF) testing for JC viral DNA and repeat neurological assessments, should be considered.

If PML is confirmed, discontinue treatment permanently.

### *Hepatitis B reactivation*

There were no reports of Hepatitis B reactivation in MS patients treated with Ocrevus. Hepatitis B virus (HBV) reactivation, in some cases resulting in fulminant hepatitis, hepatic failure and death, has been reported in patients treated with anti-CD20 antibodies.

HBV screening should be performed in all patients before initiation of treatment with Ocrevus as per institutional guidelines. Patients with active HBV (i.e. an active infection confirmed by positive results for Hepatitis B surface antigen (HBsAg) and anti-HB testing) should not be treated with Ocrevus. Patients with positive serology (i.e. negative for HBsAg and positive for HB core antibody (HBcAb+)) and carriers of HBV (positive for surface antigen (HBsAg+)) should consult liver disease experts before start of treatment and should be monitored and managed according to current clinical practice.

### ***Treatment with Immunosuppressants before, during or after Ocrevus***

When initiating Ocrevus after an immunosuppressive therapy or initiating an immunosuppressive therapy after Ocrevus, the potential for overlapping pharmacodynamic effects should be taken into consideration (see section 5.1). Exercise caution when prescribing Ocrevus taking into consideration the pharmacodynamics of other disease-modifying MS therapies. Ocrevus has not been studied in combination with other disease-modifying MS therapies.

### ***Vaccinations***

The safety of immunisation with live or live-attenuated viral vaccines following Ocrevus therapy has not been studied and vaccination with live or live-attenuated viral vaccines is not recommended during treatment and until B-cell repletion (see section 5.1).

After treatment with Ocrevus over 2 years, the proportion of patients with positive antibody titres against *S.pneumoniae*, mumps, rubella and varicella were generally similar to the proportions at baseline.

No data are available on the effects of vaccination in patients receiving Ocrevus. Physicians should review the immunisation status of patients being considered for treatment with Ocrevus. Patients should complete their vaccinations at least 6 weeks prior to initiation of Ocrevus.

### ***Use in Renal Impairment***

The safety and efficacy of Ocrevus in patients with renal impairment have not been formally studied. Patients with mild renal impairment were included in clinical trials. Ocrevus is a monoclonal antibody and cleared via catabolism rather than renal excretion, and a change in dose is not expected to be required for patients with renal impairment (see section 5.2).

### ***Use in Hepatic Impairment***

The safety and efficacy of Ocrevus in patients with hepatic impairment have not been formally studied. Patients with mild hepatic impairment were included in clinical trials. Ocrevus is a monoclonal antibody and cleared via catabolism rather than hepatic metabolism, and a change in dose is not expected to be required for patients with hepatic impairment (see section 5.2).

### ***Paediatric Use***

The safety and efficacy of Ocrevus in children and adolescents (< 18 years of age) have not been studied.

### ***Use in the Elderly***

The safety and efficacy of Ocrevus in patients  $\geq 65$  years of age have not been studied.

### ***Effect on Laboratory Tests***

See section 4.8.

## **4.5 Interaction with Other Medicines and Other Forms of Interaction**

No formal drug interaction studies have been performed as no drug interactions are expected via CYP and other metabolising enzymes or transporters.

## **4.6 Fertility, Pregnancy and Lactation**

### ***Use in Pregnancy – Category C***

Ocrevus should be avoided during pregnancy unless the potential benefit to the mother outweighs the potential risk to the foetus. Ocrevus is a humanised monoclonal antibody and immunoglobulins are known to cross the placental barrier. Women of child bearing potential should use effective contraception while receiving Ocrevus and for 6 months after the last infusion (see section 5.2).

B-cell levels in human neonates following maternal exposure to Ocrevus have not been studied in clinical trials. There are no adequate and well-controlled data from studies in pregnant women, however transient peripheral B-cell depletion and lymphocytopenia have been reported in infants born to mothers exposed to other anti-CD20 antibodies during pregnancy.

### ***Use in Lactation***

As human IgG is excreted in human milk and the potential for Ocrevus absorption leading to B-cell depletion is unknown, women should be advised to discontinue breast-feeding during Ocrevus therapy. Animal studies have shown excretion of Ocrevus in breast milk (see section 5.3).

It is unknown whether Ocrevus is excreted in human breast milk or has any effect on the breast-fed child and on milk production.

## **4.7 Effects on Ability to Drive and Use Machines**

No studies on the effects of Ocrevus on the ability to drive and to use machines have been performed. The pharmacological activity and adverse events reported to date do not indicate such an effect is likely.

## **4.8 Undesirable Effects**

The safety of Ocrevus has been established in 1311 patients across MS clinical studies, which includes 825 patients in active-controlled RMS clinical trials and 486 patients in a placebo-controlled PPMS trial. Table 2 summarises the adverse drug reactions (ADRs) that have been reported in association with the use of Ocrevus in clinical trials. The most frequently reported ADRs were IRRs and respiratory tract infections.



### RMS

The ADRs described in this section were identified based on data from two identical active-controlled studies (WA21092 and WA21093) evaluating the efficacy and safety of Ocrevus in adults with RMS. In the two studies, patients (n=825) were given Ocrevus 600 mg, every 6 months (with the first dose administered as two 300 mg IV infusions separated by two weeks and all subsequent doses as a single, 600 mg infusion), or interferon beta-1a (IFN) 44 mcg (n=826) s.c. three times per week. The controlled period of the study was 96 weeks (four doses of Ocrevus).

### PPMS

The ADRs described in this section were identified based on data from a placebo-controlled study (WA25046) evaluating the efficacy and safety of Ocrevus in adults with PPMS. Patients were given Ocrevus 600 mg (n=486) or placebo (n=239) every 6 months (administered as two 300 mg infusions separated by two weeks during the entire study).

Frequencies are defined as very common ( $\geq 1/10$ ), common ( $\geq 1/100$  to  $< 1/10$ ), uncommon ( $\geq 1/1000$  to  $< 1/100$ ), rare ( $\geq 1/10,000$  to  $< 1/1000$ ) and very rare ( $< 1/10,000$ ). Adverse reactions are presented in order of decreasing frequency.

**Table 2 Summary of ADRs associated with Ocrevus (RMS or PPMS) with an incidence of  $\geq 2\%$  and higher than the comparator<sup>1</sup>**

ADR (MedDRA)	RMS Pooled WA21092 & WA21093		PPMS WA25046 <sup>2</sup>		Frequency category for Ocrevus
	Ocrevus (n=825)	Interferon beta-1a (n=826)	Ocrevus (n=486)	Placebo (n=239)	
<b>Injury, Poisoning and Procedural Complications</b>					
Infusion-related reactions <sup>3</sup>	283 (34.3%)	82 (9.9%)	195 (40.1%)	61 (25.5%)	Very common
<b>Infections and Infestations</b>					
Upper respiratory tract infection	125 (15.2%)	88 (10.7%)	59 (12.1%)	14 (5.9%)	Very common
Nasopharyngitis	123 (14.9%)	84 (10.2%)	117 (24.1%)	67 (28.0%)	Very common
Sinusitis	46 (5.6%)	45 (5.4%)	19 (3.9%)	7 (2.9%)	Common
Bronchitis	42 (5.1%)	29 (3.5%)	31 (6.4%)	15 (6.3%)	Common
Influenza	38 (4.6%)	39 (4.7%)	57 (11.7%)	20 (8.4%)	Very common
Gastroenteritis	25 (3.0%)	19 (2.3%)	22 (4.5%)	12 (5.0%)	Common
Oral herpes	25 (3.0%)	18 (2.2%)	13 (2.7%)	2 (0.8%)	Common
Respiratory tract infection	19 (2.3%)	17 (2.1%)	13 (2.7%)	2 (0.8%)	Common
Viral infection	18 (2.2%)	23 (2.8%)	15 (3.1%)	4 (1.7%)	Common
Herpes zoster	17 (2.1%)	8 (1.0%)	8 (1.6%)	4 (1.7%)	Common
Conjunctivitis	9 (1.1%)	5 (0.6%)	10 (2.1%)	1 (0.4%)	Common
Cellulitis	7 (0.8%)	5 (0.6%)	11 (2.3%)	1 (0.4%)	Common



<b>Respiratory, Thoracic and Mediastinal Disorders</b>					
Cough	25 (3.0%)	12 (1.5%)	34 (7.0%)	8 (3.3%)	Common
Catarrh	0	0	10 (2.1%)	2 (0.8%)	Common

<sup>1</sup> Interferon beta-1a 44 mcg s.c. or placebo

<sup>2</sup> PPMS patients were randomised 2:1 (Ocrevus:placebo)

<sup>3</sup> Symptoms reported as IRRs within 24 hours of infusion are described below under *Infusion Related Reactions*

### ***Infusion Related Reactions***

Across the RMS and PPMS trials, symptoms associated with IRRs included, but are not limited to, pruritus, rash, urticarial, erythema, flushing, hypotension, pyrexia, fatigue, headache, dizziness, throat irritation, oropharyngeal pain, dyspnoea, pharyngeal or laryngeal oedema, nausea and tachycardia. In the controlled clinical trials there were no fatal IRRs.

In the active-controlled RMS clinical trials, IRRs were the most common adverse event in patients treated with Ocrevus 600 mg with an overall incidence of 34.3% compared with an incidence of 9.9% in the interferon beta-1a treatment group (placebo infusion). The incidence of IRRs was highest during Dose 1, infusion 1 (27.5%) and decreased over time to <10% at Dose 4. The majority of IRRs in both treatment groups were mild to moderate (see section 4.4).

In the placebo-controlled PPMS clinical trial, the incidence of IRRs was highest during Dose 1, infusion 1 (27.4%) and decreased with subsequent doses to < 10% at Dose 4. A greater proportion of patients in each group experienced IRRs with the first infusion of each dose compared with the second infusion of that dose. The majority of IRRs were mild to moderate (see section 4.4).

### ***Infection***

There was no increase in serious infections associated with Ocrevus treatment. In RMS patients the rate of serious infections was lower than for interferon beta-1a, and in PPMS patients the rate was similar to placebo.

In the active-controlled RMS and placebo-controlled PPMS clinical trials, respiratory tract infections and herpes infections (both predominantly mild to moderate) were more frequently reported in the Ocrevus treatment arm.

### ***Respiratory Tract Infections***

The proportion of respiratory tract infections was higher in the Ocrevus treated patients compared to interferon and placebo. The infections were predominantly mild to moderate and consisted mostly of upper respiratory tract infections (including nasopharyngitis) and bronchitis (see Table 2).

### ***Herpes***

In the active-controlled RMS clinical trials, herpes infections were reported more frequently in Ocrevus treated patients than interferon beta-1a treated patients including herpes zoster (2.1% vs 1.0%), herpes simplex (0.7% vs 0.1%) and oral herpes (3.0% vs 2.2%), genital herpes (0.1% vs 0%), herpes virus infection (0.1% vs 0%). Infections were predominantly mild to moderate in severity and patients recovered with treatment by standard therapies. There were no reports of disseminated herpes.

In the placebo-controlled PPMS clinical trial, a higher proportion of patients with oral herpes (2.7% vs 0.8%) were observed in the Ocrevus treatment arm.

### ***Serious Infections from Clinical Trials in Autoimmune Conditions other than MS***

Ocrevus in combination with concomitant immunosuppressive medications (e.g. chronic steroids, non-biologic and biologic disease-modifying antirheumatic drugs (DMARDs), mycophenolate mofetil, cyclophosphamide and azathioprine) has been studied in other autoimmune conditions.

The majority of available data is from studies in patients with rheumatoid arthritis (RA), where an imbalance in serious infections was observed including, but not limited to, atypical pneumonia and pneumocystis jirovecii pneumonia, varicella pneumonia, tuberculosis, histoplasmosis in the Ocrevus-immunosuppressant group. In rare cases some of these infections were fatal. Serious infections were reported more frequently in the 1000 mg dose group compared to the 400 mg dose group or immunosuppressant-placebo group.

Risk factors for serious infections in these trials included other comorbidities, chronic use of immunosuppressants/steroids, and patients from Asia.

### ***Laboratory Abnormalities***

#### **Immunoglobulins**

Treatment with Ocrevus resulted in a decrease in total immunoglobulins over the controlled period of the studies, mainly driven by reduction in IgM, with no apparent association with serious infections.

In the active-controlled RMS clinical trials, the proportion of patients at baseline reporting IgG, IgA and IgM < lower limit of normal (LLN) in the Ocrevus treatment arm was 0.5%, 1.5% and 0.1%, respectively. Following treatment, the proportion of Ocrevus-treated patients reporting IgG, IgA and IgM < LLN at 96 weeks was 1.5%, 2.4% and 16.5%, respectively.

In the placebo-controlled PPMS clinical trial, the proportion of patients at baseline reporting IgG, IgA and IgM < LLN in the Ocrevus treatment arm was 0.0%, 0.2% and 0.2%, respectively. Following treatment, the proportion of Ocrevus-treated patients reporting IgG, IgA and IgM < LLN at 120 weeks was 1.1%, 0.5% and 15.5%, respectively.

#### **Neutrophils**

In the active-controlled treatment period of the RMS clinical trials, decreased neutrophils were observed in 14.7% of Ocrevus patients as compared to 40.9% of patients treated with interferon beta-1a. In the placebo-controlled PPMS clinical trial, the proportion of Ocrevus patients presenting decreased neutrophils was slightly higher (12.9%) than placebo patients (10.0%).

In the majority of cases decreased neutrophils were transient (only observed once for a given patient treated with Ocrevus) and were Grade 1 and 2 in severity.

Overall, approximately 1% of the patients in the Ocrevus group had Grade 3 or 4 neutropenia. These were not temporally associated with an infection.

## 4.9 Overdose

There is limited clinical trial experience with doses higher than the approved IV dose of Ocrevus. The highest dose tested to date in MS patients is 2000 mg, administered as two 1000 mg IV infusions separated by two weeks (Phase II dose finding study in RRMS). The ADRs were consistent with the safety profile for Ocrevus in the pivotal clinical studies.

There is no specific antidote in the event of an overdose. Interrupt the infusion immediately and observe the patient for IRRs (see section 4.4).

Treatment of overdose should consist of general supportive measures.

Contact the Poison Information Centre for advice on management of overdosage.

## 5. PHARMACOLOGICAL PROPERTIES

### 5.1 Pharmacodynamic Properties

Ocrelizumab is a recombinant humanised monoclonal antibody that selectively targets CD20-expressing B-cells. CD20 is a cell surface antigen found on pre-B-cells, mature and memory B-cells but not expressed on lymphoid stem cells and plasma cells.

The precise mechanisms through which ocrelizumab exerts its therapeutic clinical effects in multiple sclerosis (MS) are not fully elucidated but is presumed to involve immunomodulation through the reduction in the number and function of CD20-expressing B-cells. Following cell surface binding, ocrelizumab selectively depletes CD20-expressing B-cells through antibody-dependent cellular phagocytosis, antibody-dependent cellular cytotoxicity, complement-dependent cytotoxicity, and apoptosis. The capacity of B-cell reconstitution and pre-existing humoral immunity are preserved. In addition, innate immunity and total T-cell numbers are not affected.

Treatment with Ocrevus leads to rapid depletion of CD19+ B-cells in blood by 14 days post-treatment (first time-point of assessment) as an expected pharmacologic effect. This was sustained throughout the treatment period. For the B-cell counts, CD19 is used as the presence of Ocrevus interferes with the detection of CD20 by the assay.

In the Phase III studies, between each dose of Ocrevus, up to 5% of patients showed B-cell repletion (> lower limit of normal (LLN) or baseline) at least at one time point. The extent and duration of B-cell depletion was consistent in the primary progressive MS (PPMS) and relapsing forms of MS (RMS) trials.

The longest follow up time after the last Ocrevus infusion (Phase II WA21493, n=51) indicates that the median time to B-cell repletion (return to baseline/LLN, whichever occurred first) was 72 weeks (range 27-175 weeks). Ninety percent of all patients had their B-cells repleted to LLN or baseline by approximately two and a half years after the last infusion.

### Clinical Trials

#### *Relapsing forms of MS (RMS)*

The efficacy and safety of Ocrevus were evaluated in two randomised, double-blind, double-dummy, active comparator-controlled clinical trials with identical design in patients with

RMS (in accordance with McDonald criteria 2010). Study design and baseline characteristics of the study population are summarised in Table 3.

Demographic and baseline characteristics were well balanced across the two treatment groups. Patients receiving Ocrevus (Group A) were given 600 mg every 6 months (Dose 1 - two x 300 mg IV infusions, administered two weeks apart), and subsequent doses were administered as a single 600 mg IV infusion. Patients in Group B were administered interferon beta-1a (Rebif<sup>®</sup>) 44 mcg subcutaneous (s.c.) injection three times per week.

Key clinical and magnetic resonance imaging (MRI) efficacy results are presented in Table 4 and Figure 1.

**Table 3 Study design and demographic characteristics for studies WA21092 and WA21093 (RMS)**

	Study 1		Study 2	
Study name	WA21092 (OPERA I) (n=821)		WA21093 (OPERA II) (n=835)	
<b>Study Design</b>				
<b>Population</b>	<ul style="list-style-type: none"> <li>Patients with relapsing forms of MS</li> </ul>			
<b>Disease history at screening</b>	<ul style="list-style-type: none"> <li>At least two relapses within the prior two years or one relapse within the prior year</li> <li>EDSS between 0 and 5.5, inclusive</li> </ul>			
<b>Study duration</b>	<ul style="list-style-type: none"> <li>Two years (96 weeks)</li> </ul>			
<b>Treatment groups</b>	<ul style="list-style-type: none"> <li>Group A: Ocrevus 600 mg</li> <li>Group B: interferon beta-1a (Rebif<sup>®</sup>), 44 mcg s.c. (IFN)</li> </ul>			
<b>Baseline Characteristics</b>	Ocrevus 600 mg (n=410)	IFN 44 mcg (n=411)	Ocrevus 600 mg (n=417)	IFN 44 mcg (n=418)
Mean age (years)	37.1	36.9	37.2	37.4
Gender distribution (% male/% female)	34.1 / 65.9	33.8 / 66.2	35.0 / 65.0	33.0 / 67.0
Mean/Median duration since onset of MS symptoms (years)	6.74 / 4.88	6.25 / 4.62	6.72 / 5.16	6.68 / 5.07
Mean/Median disease duration since diagnosis (years)	3.82 / 1.53	3.71 / 1.57	4.15 / 2.10	4.13 / 1.84
Mean number of relapses in the last year	1.31	1.33	1.32	1.34
Mean Gd-enhancing T1 lesion count	1.69	1.87	1.82	1.95
Mean T2 lesion count	51.04	51.06	49.26	51.01

**Table 4 Key clinical and MRI endpoints from studies WA21092 and WA21093**

	Study 1: WA21092 (OPERA I)		Study 2: WA21093 (OPERA II)	
	Ocrevus 600 mg (n=410)	IFN 44 mcg (n=411)	Ocrevus 600 mg (n=417)	IFN 44 mcg (n=418)
<b>Clinical Endpoints</b>				
<b>Primary efficacy endpoint</b> Annualised Relapse Rate	0.156	0.292	0.155	0.290
Relative Reduction	46% (p < 0.0001)		47% (p < 0.0001)	
Proportion of patients with 12-week Confirmed Disability Progression <sup>3</sup>	9.8% Ocrevus vs 15.2% IFN			
Risk Reduction (Pooled Analysis <sup>1</sup> )	40% (p=0.0006)			
Risk Reduction (Individual Studies <sup>2</sup> )	43% (p=0.0139)		37% (p=0.0169)	
Proportion of patients with 24-week Confirmed Disability Progression <sup>3</sup>	7.6% Ocrevus vs 12.0% IFN			
Risk Reduction (Pooled Analysis <sup>1</sup> )	40% (p=0.0025)			
Risk Reduction (Individual Studies <sup>2</sup> )	43% (p=0.0278)		37% (p=0.0370)	
Proportion of patients with at least 12- week Confirmed Disability Improvement <sup>4</sup> (Pooled)	20.7% Ocrevus vs 15.6% IFN			
Relative Increase (Pooled Analysis <sup>1</sup> )	33% (p=0.0194)			
Relative Increase (Individual Studies <sup>2</sup> )	61% (p=0.0106)		14% (p=0.4019)	
Mean change from baseline in Multiple Sclerosis Functional Composite (MSFC)	0.213	0.174	0.276	0.169
Difference	0.039 (p=0.3261)		0.107 (p=0.0040)	
Proportion of patients with No Evidence of Disease Activity (NEDA) <sup>5</sup>	48%	29%	48%	25%
Relative Increase <sup>2</sup>	64% (p<0.0001)		89% (p<0.0001)	
<b>MRI Endpoints</b>				
Mean number of T1 Gd-enhancing lesions per MRI scan	0.016	0.286	0.021	0.416
Relative Reduction	94% (p<0.0001)		95% (p<0.0001)	
Mean number of new and/or enlarging T2 hyperintense lesions per MRI scan	0.323	1.413	0.325	1.904

Relative Reduction	77% (p<0.0001)		83% (p<0.0001)	
Mean number of new T1-hypo-intense lesions (chronic black holes) per MRI scan	0.420	0.982	0.449	1.255
Relative reduction	57% (p<0.0001)		64% (p<0.0001)	
Percentage change in brain volume from week 24 to week 96	-0.572	-0.741	-0.638	-0.750
Relative reduction in brain volume loss	22.8% (p=0.0042) <sup>6</sup>		14.9% (p=0.0900)	
<b>Quality of Life</b>				
Mean change from baseline in SF-36 Physical Component Summary	0.036	-0.657	0.326	-0.833
Difference	0.693 (p=0.2193)		1.159 (p=0.0404) <sup>6</sup>	

<sup>1</sup> Data prospectively pooled from Study 1 & 2

<sup>2</sup> Non-confirmatory p-value; analysis not part of the pre-specified testing hierarchy

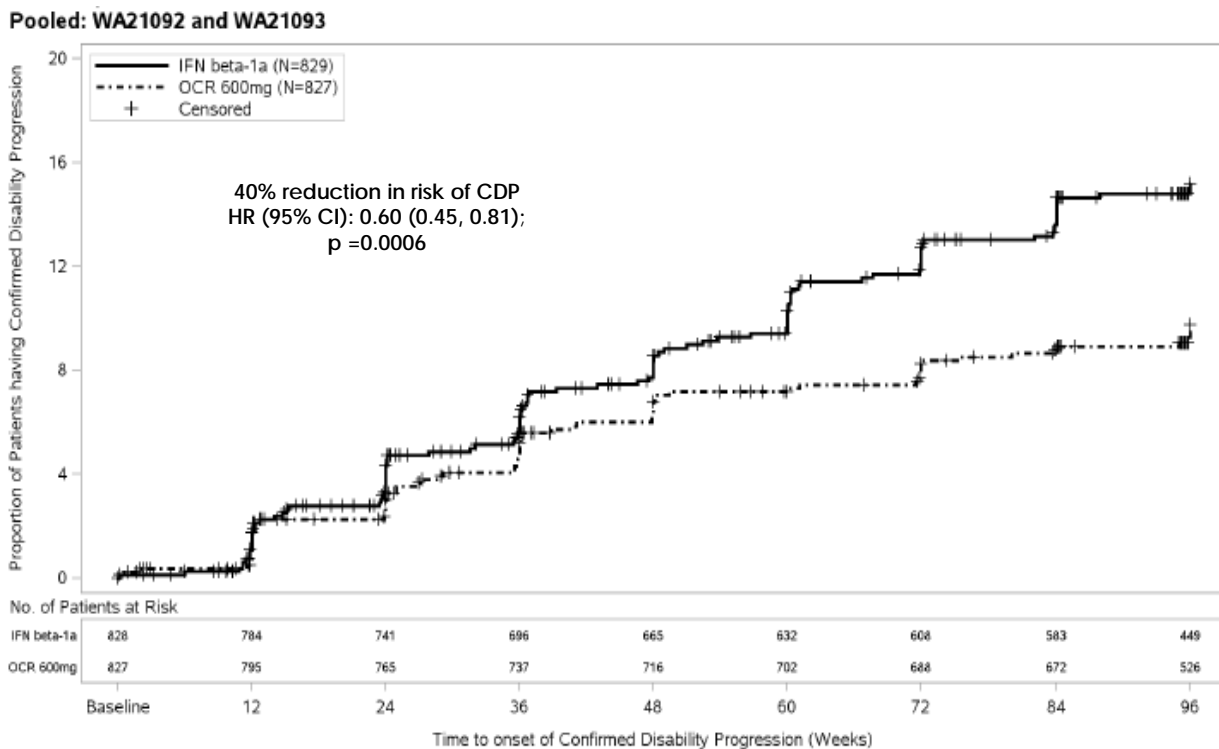
<sup>3</sup> Defined as an increase of  $\geq 1.0$  point from the baseline Expanded Disability Status Scale (EDSS) score for patients with baseline EDSS score of 5.5 or less, or  $\geq 0.5$  when the baseline score is  $> 5.5$ ; Kaplan-Meier estimates at Week 96

<sup>4</sup> Defined as decrease of  $\geq 1.0$  point from the baseline EDSS score for patients with baseline EDSS score of  $\geq 2$  and  $\leq 5.5$ , or  $\geq 0.5$  when the baseline score is  $> 5.5$ . Patients with baseline score  $< 2$  were not included in analysis

<sup>5</sup> NEDA defined as absence of protocol defined relapses, Confirmed Disability Progression and any MRI activity (either Gd-enhancing T1 lesions, or new or enlarging T2 lesions) during the whole 96 week treatment period. Exploratory result based on complete ITT population

<sup>6</sup> Non-confirmatory p-value; hierarchical testing procedure terminated before reaching endpoint

**Figure 1 Kaplan-Meier plot of time to onset of confirmed disability progression sustained for at least 12 weeks with the initial event of neurological worsening occurring during the double-blind treatment period (pooled ITT population)\***



\*Pre-specified pooled analysis of OPERA I & II

Results of the pre-specified pooled analyses of time to CDP sustained for at least 12 weeks (40% risk reduction for Ocrevus compared to interferon beta-1a,  $p=0.0006$ ) were highly consistent with the results sustained for at least 24 weeks (40% risk reduction for Ocrevus compared to interferon beta-1a,  $p=0.0025$ ).

### ***Primary Progressive MS (PPMS)***

The efficacy and safety of Ocrevus were evaluated in a randomised, double-blind, placebo-controlled clinical trial in patients with PPMS (Study WA25046). Study design and baseline characteristics of the study population are presented in Table 5. Demographic and baseline characteristics were well balanced across the two treatment groups.

Throughout the treatment period patients receiving Ocrevus (Group A) were given 600 mg every 6 months (as two x 300 mg IV infusions, administered two weeks apart). Patients in Group B were administered placebo. The 600 mg infusions in RMS and the two x 300 mg infusions in PPMS demonstrated consistent PK/PD profiles. Infusion related reactions (IRRs) profiles per infusion were also similar, independent of whether the 600 mg dose was administered as a single 600 mg infusion or as two x 300 mg infusions two weeks apart (see sections 4.8 and 5.1), but due to overall more infusions with the two x 300 mg regimen, the total number of IRRs were higher. Therefore, after Dose 1 it is recommended to administer Ocrevus in a single 600 mg infusion (see Table 1) to reduce the total number of infusions (and concurrent exposure to prophylactic methylprednisolone) and IRRs.



**Table 5 Study design and baseline characteristics for study WA25046**

Study name	WA25046 (ORATORIO) (n=732)	
Study Design		
<b>Population</b>	<ul style="list-style-type: none"> <li>Patients with primary progressive MS</li> </ul>	
<b>Disease history at screening</b>	<ul style="list-style-type: none"> <li>Age 18 – 55 years</li> <li>EDSS between 3.0 and 6.5</li> </ul>	
<b>Study duration</b>	<ul style="list-style-type: none"> <li>Event-driven (minimum 120 weeks and 253 confirmed disability progression events)</li> <li>Median follow-up time – Ocrevus 3.0 years, placebo 2.8 years</li> </ul>	
<b>Treatment groups</b>	<ul style="list-style-type: none"> <li>Group A: Ocrevus 600 mg</li> <li>Group B: placebo, 2:1 randomisation</li> </ul>	
<b>Baseline Characteristics</b>	OCREVUS 600 mg (n=488)	Placebo (n=244)
Mean age (years)	44.7	44.4
Gender distribution (% male/% female)	51.4 / 48.6	49.2 / 50.8
Mean/Median duration since onset of MS symptoms (years)	6.7 / 6.0	6.1 / 5.5
Mean/Median disease duration since diagnosis (years)	2.9 / 1.6	2.8 / 1.3
Mean EDSS	4.7	4.7

Key clinical and MRI efficacy results are presented in Table 6 and Figure 2.

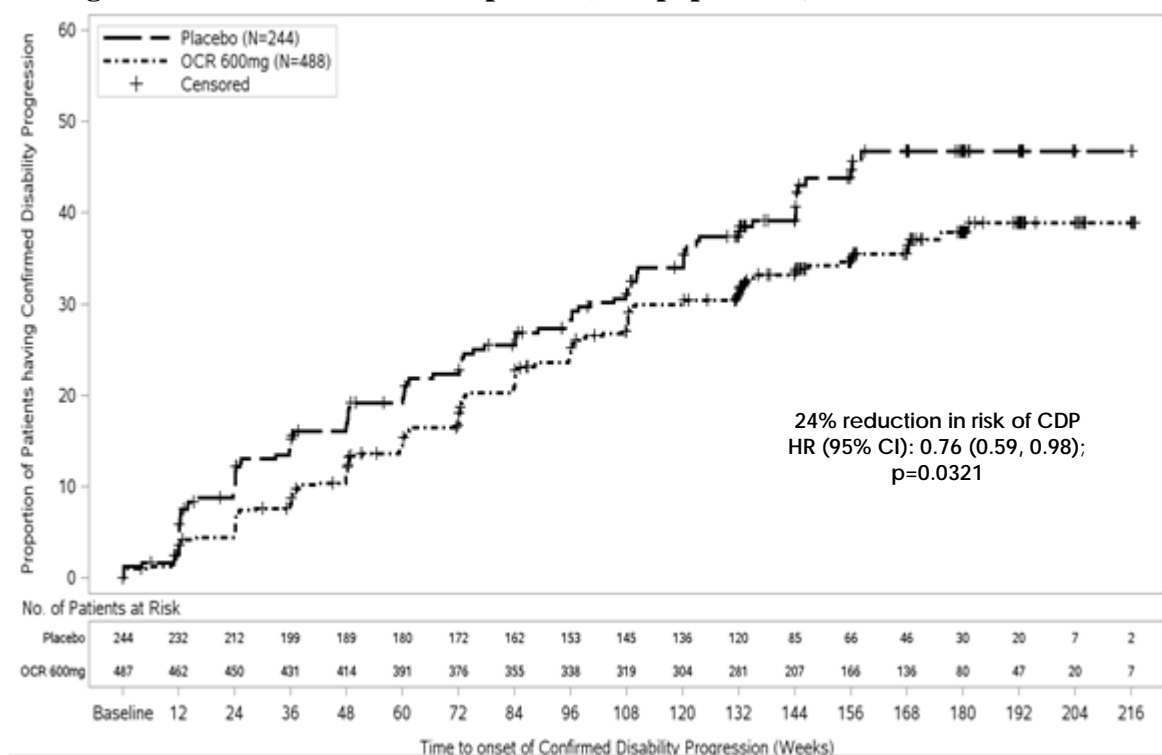
**Table 6 Key clinical and MRI endpoints from study WA25046 (PPMS)**

	Study 3: WA25046 (ORATORIO)	
	Ocrevus 600 mg (n=488)	Placebo (n=244)
<b>Clinical Endpoints</b>		
<b>Primary efficacy endpoint</b>		
Proportion of patients with 12 weeks Confirmed Disability Progression <sup>1</sup>	30.2%	34.0%
Risk Reduction	24% (p=0.0321)	
Proportion of patients with 24 weeks Confirmed Disability Progression <sup>1</sup>	28.3%	32.7%
Risk Reduction	25% (p=0.0365)	
Percentage change in timed 25-foot walk from baseline to week 120	38.9	55.1
Relative reduction in progression rate of	29.4%	

walking time	(p=0.0404)	
<b>MRI Endpoints</b>		
Percentage change in T2 hyperintense lesion volume, from baseline to week 120	-3.4	7.4
	p<0.0001	
Percentage change brain volume from week 24 to week 120	-0.902	-1.093
Relative reduction in rate of brain volume loss	17.5% (p=0.0206)	
<b>Quality of Life</b>		
Mean change from baseline in SF-36 Physical Component Summary	-0.731	-1.108
Difference	0.377 (p=0.6034)	

<sup>†</sup> Defined as an increase of  $\geq 1.0$  point from the baseline EDSS score for patients with baseline score of  $\leq 5.5$ , or  $\geq 0.5$  when the baseline score is  $> 5.5$ ; Kaplan-Meier estimates at week 120

**Figure 2 Kaplan-Meier plot of time to onset of confirmed disability progression sustained for at least 12 weeks with the initial event of neurological worsening occurring during the double-blind treatment period (ITT population)\***



\*All patients in this analysis had a minimum of 120 weeks of follow-up. The primary analysis is based on all events occurred

### **Immunogenicity**

Patients in the MS trials (WA21092, WA21093 and WA25046) were tested at multiple time points (baseline and every 6 months post treatment for the duration of the trial) for anti-drug antibodies (ADAs). Out of 1311 patients treated with ocrelizumab, 12 (~1%) tested positive

for treatment-emergent ADAs, of which two patients tested positive for neutralising antibodies. The impact of treatment-emergent ADAs on safety and efficacy cannot be assessed given the low incidence of ADA associated with Ocrevus.

Immunogenicity data are highly dependent on the sensitivity and specificity of the test methods used. Additionally, the observed incidence of a positive result in a test method may be influenced by several factors, including sample handling, timing of sample collection, drug interference, concomitant medication and the underlying disease. Therefore comparison of the incidence of antibodies to Ocrevus with the incidence of antibodies to other products may be misleading.

## 5.2 Pharmacokinetic Properties

Pharmacokinetics of ocrelizumab in the MS studies were described by a two compartment model with time-dependent clearance, and with pharmacokinetic (PK) parameters typical for an IgG1 monoclonal antibody. Clearance and central volume were estimated at 0.17 L/day and 2.78 L, peripheral volume and inter-compartment clearance at 2.68 L and 0.294 L/day, and initial time-dependent clearance at 0.0489 L/day which declined with a half-life of 33 weeks. The overall exposure (area under curve (AUC) over the 24 week dosing intervals) was identical in the 2 x 300 mg PPMS study and the 1 x 600 mg RMS studies, as expected given an identical dose was administered.  $AUC_{\tau}$  after the fourth dose of 600 mg OCREVUS was 3510  $\mu\text{g/mL}\cdot\text{day}$ , and mean maximum concentration ( $C_{\text{max}}$ ) was 212  $\mu\text{g/mL}$  in RMS (600 mg infusion) and 141  $\mu\text{g/mL}$  in PPMS (300 mg infusions). Terminal half-life was 26 days.

### *Absorption*

Ocrelizumab is administered intravenously. There have been no clinical studies performed with other routes of administration.

### *Distribution*

The population PK estimate of the central volume of distribution was 2.78 L. Peripheral volume and inter-compartment clearance were estimated at 2.68 L and 0.294 L/day.

### *Metabolism*

The metabolism of ocrelizumab has not been directly studied, as antibodies are cleared principally by catabolism.

### *Excretion*

Constant clearance was estimated at 0.17 L/day, and initial time-dependent clearance at 0.0489 L/day which declined with a half-life of 33 weeks. The terminal elimination half-life was 26 days.

## Pharmacokinetics in Special Populations

### *Elderly Patients*

No studies have been conducted to investigate the PK of ocrelizumab in patients  $\geq 65$  years.

### *Paediatric Patients*

No studies have been conducted to investigate the PK of ocrelizumab in children and adolescents (< 18 years of age).

### *Renal Impairment*

No formal PK study has been conducted. Patients with mild renal impairment were included in clinical trials and no change in the PK of ocrelizumab was observed in those patients.

### *Hepatic Impairment*

No formal PK study has been conducted. Patients with mild hepatic impairment were included in clinical trials and no change in the PK of ocrelizumab was observed in those patients.

## **5.3 Preclinical Safety Data**

### ***Genotoxicity***

No studies have been performed to assess the mutagenic potential of Ocrevus. As an antibody Ocrevus is not expected to interact with DNA or other chromosomal material.

### ***Carcinogenicity***

No carcinogenicity studies have been performed as no appropriate animal or in vitro models are available to assess the carcinogenic potential of Ocrevus.

### ***Fertility***

Preclinical data reveal no special hazards for humans based on studies of male and female fertility in cynomolgus monkeys.

### ***Teratogenicity***

It is not known whether Ocrevus can cause harm to the foetus when administered to pregnant women or whether it affects reproductive capacity. In an embryo-foetal developmental study in cynomolgus monkeys, there was no evidence of maternal toxicity, teratogenicity or embryotoxicity following Ocrevus administration at 75 mg/kg (loading dose) or 100 mg/kg (study dose). As IgG molecules are known to cross the placental barrier Ocrevus causes depletion of B-cells in the foetuses of treated cynomolgus monkeys.

In a pre- and post-natal development study in cynomolgus monkeys, administration of Ocrevus 15/20 and 75/100 mg/kg loading/study doses (which correspond to human equivalent doses of approximately 3,000 mg (approximately 5 x clinical dose) and 15,000 mg (approximately 25 x clinical dose), respectively) were associated with glomerulopathy (7/24 animals), and lymphoplasmacytic inflammation in the kidney (2/24 animals). Testicular weights of the neonates were significantly reduced in the 75/100 mg/kg group compared with controls. There were two cases of moribundity on study (2/24), one attributed to weakness due to premature birth accompanied by opportunistic infection and the other to an infective meningoencephalitis involving the cerebellum of the offspring from a maternal dam with an active infection (mastitis). The course of both neonatal infections could have potentially been impacted by B-cell depletion. Newborn offspring of maternal animals exposed to Ocrevus were noted to have depleted B-cell populations during the post-natal phase. Measurable levels

of ocrelizumab were detected in milk (approximately 0.2% of steady state trough serum levels) during the lactation period (see section 4.6).

### ***Other***

Preclinical data reveal no special hazards for humans based on conventional studies of safety pharmacology, acute and repeated dose toxicity.

## **6. PHARMACEUTICAL PARTICULARS**

### **6.1 List of Excipients**

Each vial of Ocrevus contains the following excipients: 20 mM sodium acetate, 106 mM trehalose dihydrate, acetic acid - glacial, 0.02% (w/v) polysorbate 20 and water for injections.

### **6.2 Incompatibilities**

No incompatibilities between Ocrevus and polyvinyl chloride or polyolefine bags, and IV administration sets have been observed. Do not use diluents other than 0.9% sodium chloride to dilute Ocrevus since use has not been tested.

### **6.3 Shelf-life**

18 months

#### *Shelf-life of reconstituted solution*

OCREVUS does not contain any anti-microbial preservative; therefore, care must be taken to ensure the sterility of the prepared solution. Product is for single use in one patient only. Discard any residue.

To reduce microbiological hazard, the prepared infusion solution should be used immediately. If storage is necessary, hold at 2°C - 8°C for not more than 24 hours and 8 hours at room temperature.

In the event an IV infusion cannot be completed the same day, the remaining solution should be discarded.

### **6.4 Special Precautions for Storage**

Store vial in a refrigerator at 2°C to 8°C. Keep vial in the outer carton in order to protect from light. Do not freeze. Do not shake. Do not use after the expiry date (EXP) shown on the pack.

### **6.5 Nature and Contents of Container**

Single-use 15 mL-sized glass vial containing 10 mL of solution at pH 5.3.

### **6.6 Special Precautions for Disposal**

The release of medicines into the environment should be minimised. Medicines should not be disposed of via wastewater and disposal through household waste should be avoided. Unused or expired medicine should be returned to a pharmacy for disposal.

The following should be strictly adhered to regarding the use and disposal of syringes and other medicinal sharps:

- Needles and syringes should never be reused
- Place all used needles and syringes into a sharps container (puncture-proof disposable container)

## **7. MEDICINE SCHEDULE**

Prescription Medicine.

## **8. SPONSOR**

Distributed in New Zealand by:  
Roche Products (New Zealand) Limited  
PO Box 109113, Newmarket, Auckland 1149  
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Medical enquiries: 0800 276 243

## **9. DATE OF FIRST APPROVAL**

21 December 2017

## **10. DATE OF REVISION OF THE TEXT**

N/A

## **SUMMARY TABLE OF CHANGES**

N/A