

# AUSTRALIAN PRODUCT INFORMATION

## REVLIMID® (lenalidomide) Capsules

**Do not use Revlimid during pregnancy.**

**Teratogenic Effects: Revlimid (lenalidomide) is structurally related to thalidomide. Thalidomide is a known human teratogen that causes severe life-threatening human birth defects. If lenalidomide is taken during pregnancy, it may cause birth defects or death to an unborn baby. Women should be advised to avoid pregnancy whilst taking Revlimid (lenalidomide), during dose interruptions, and for 4 weeks after stopping the medication.**

### 1 NAME OF THE MEDICINE

Australian approved name: lenalidomide

### 2 QUALITATIVE AND QUANTITATIVE COMPOSITION

Each 2.5 mg capsule contains 2.5 mg lenalidomide and 73.5 mg of lactose (as anhydrous lactose).

Each 5 mg capsule contains 5 mg lenalidomide and 147 mg of lactose (as anhydrous lactose).

Each 7.5 mg capsule contains 7.5 mg lenalidomide and 144.5 mg of lactose (as anhydrous lactose).

Each 10 mg capsule contains 10 mg lenalidomide and 294 mg of lactose (as anhydrous lactose).

Each 15 mg capsule contains 15 mg lenalidomide and 289 mg of lactose (as anhydrous lactose).

Each 20 mg capsule contains 20 mg lenalidomide and 244.5 mg of lactose (as anhydrous lactose).

Each 25 mg capsule contains 25 mg lenalidomide and 200 mg of lactose (as anhydrous lactose).

For the full list of excipients, see Section 6.1 (List of excipients).

#### Description

Lenalidomide is an off-white to pale-yellow solid, with a melting point between 265°C and 270°C. Lenalidomide is generally more soluble in organic solvents but exhibits the greatest solubility in 0.1N HCl buffer. The solubility of lenalidomide in water and at pH 1.21 is < 1.5 mg/mL and 18 mg/mL, respectively.

Lenalidomide has an asymmetric carbon atom and can therefore exist as the optically active forms S(-) and R(+). Lenalidomide is produced as a racemic mixture with a net optical rotation of zero.

### 3 PHARMACEUTICAL FORM

Revlimid (lenalidomide) 2.5 mg capsules: white/blue-green size 4 capsules marked “2.5 mg REV”.

Revlimid (lenalidomide) 5 mg capsules: white size 2 capsules marked “5 mg REV”.

Revlimid (lenalidomide) 7.5 mg capsules: white/pale-yellow size 2 capsules marked “7.5 mg REV”.

Revlimid (lenalidomide) 10 mg capsules: yellow/blue-green size 0 capsules marked “10 mg REV”.

Revlimid (lenalidomide) 15 mg capsules: white/blue size 0 capsules marked “15 mg REV”.

Revlimid (lenalidomide) 20 mg capsules: powder-blue/blue-green size 0 capsules marked “20 mg REV”.

Revlimid (lenalidomide) 25 mg capsules: white size 0 capsules marked “25 mg REV”.

## 4 CLINICAL PARTICULARS

### 4.1 THERAPEUTIC INDICATIONS

#### 4.1.1 Multiple Myeloma (MM)

Revlimid is indicated for the treatment of multiple myeloma.

#### 4.1.2. Myelodysplastic Syndromes (MDS)

Revlimid is indicated for treatment of patients with transfusion-dependent anaemia due to low- or intermediate-1 risk myelodysplastic syndromes associated with a deletion 5q cytogenetic abnormality with or without additional cytogenetic abnormalities.

#### 4.1.3 Mantle Cell Lymphoma (MCL)

Revlimid is indicated for the treatment of patients with relapsed and/or refractory mantle cell lymphoma.

### 4.2 DOSE AND METHOD OF ADMINISTRATION

#### **TO BE USED AS RECOMMENDED IN THIS PRODUCT INFORMATION AND PRODUCT INFORMATION DOCUMENTS FOR OTHER PRODUCTS APPROVED FOR COMBINATION THERAPY WITH REVLIMID.**

Treatment must be initiated and monitored under the supervision of a registered Specialist Physician experienced in the management of haematological and oncological malignancies.

Revlimid capsules should be administered orally at about the same time each day. The capsules should not be opened, broken or chewed. The capsules should be swallowed whole, preferably with water and either one hour before or two hours after food.

If less than 12 hours have elapsed since missing a dose, the patient can take the dose. If more than 12 hours have elapsed since missing a dose at the normal time, the patient should not take the dose, but take the next dose at the normal time on the following day.

When Revlimid is given in combination with other medicinal products, the corresponding Product Information documents must be consulted for specific dosage instructions prior to initiation of treatment.

#### 4.2.1 Dosage

##### 4.2.1.1 Multiple Myeloma

###### *4.2.1.1.1 Newly Diagnosed Multiple Myeloma – Revlimid in combination with bortezomib and dexamethasone*

Revlimid in combination with bortezomib and dexamethasone may be used as initial therapy for patients who are ineligible for autologous stem cell transplantation or as an induction regimen prior to autologous hematopoietic stem cell transplantation.

Revlimid treatment in combination with bortezomib and dexamethasone must not be started if the Absolute Neutrophil Count (ANC) is  $< 1 \times 10^9/L$  and platelet count  $< 50 \times 10^9/L$ .

During the initial period when Revlimid is used in combination with bortezomib and dexamethasone, complete blood count should be assessed every 7 days (weekly) for the first cycle, then prior to the start of each subsequent cycle. With continued use of Revlimid in combination with dexamethasone, monitor monthly (every 4 weeks). Dose interruptions and/or dose reductions may be required.

Dosing is continued or modified based upon clinical and laboratory findings. Therapy may continue until disease progression or intolerance.

### Patients who are ineligible for autologous stem cell transplantation (TNE)

- *Recommended Starting Dose (initial therapy)*

Up to eight 21-day treatment cycles (24 weeks of initial treatment) are recommended.

Patient Group	Revlimid	Bortezomib	Dexamethasone
Patients with no renal impairment	25 mg once daily on Days 1-14 of 21-day cycles	1.3 mg/m <sup>2</sup> on Days 1, 4, 8 and 11 of 21-day cycles	20 mg once daily on Days 1, 2, 4, 5, 8, 9, 11 and 12 of 21-day cycles
Patients with renal impairment	Revlimid dose as recommended in Table 1, Column 1 (Section 4.2.2.4) On Days 1-14 of repeated 21-day cycles		

- *Recommended Continued treatment: Revlimid in combination with dexamethasone until progression*

Patient Group	Revlimid	Dexamethasone
Patients with no renal impairment	25 mg once daily on Days 1-21 of repeated 28-day cycles	40 mg once daily on Days 1, 8, 15 and 22 of repeated 28-day cycles
Patients with renal impairment	Revlimid dose as recommended in Table 1, Column 1 (Section 4.2.2.4) On Days 1-21 of repeated 28-day cycles	

### Patients who are eligible for autologous stem cell transplantation (TE)

- *Recommended Starting Dose (induction regimen)*

Up to eight 21-day or six 28-day treatment cycles (24 weeks of initial treatment) are recommended.

Patient Group	Revlimid	Bortezomib	Dexamethasone
Patients with no renal impairment	25 mg once daily on Days 1-14 of 21-day cycles	1.3 mg/m <sup>2</sup> on Days 1, 4, 8 and 11 of 21-day cycles	20 mg once daily on Days 1, 2, 4, 5, 8, 9, 11 and 12 of 21-day cycles
	<b>OR</b>		
	25 mg once daily on Days 1-21 of 28-day cycles	1.3 mg/m <sup>2</sup> on Days 1, 4, 8 and 11 of 28-day cycles	20 mg once daily on Days 1-4 and 9-12 of 28-day cycles
Patients with renal impairment	Revlimid dose as recommended in Table 1, Column 1 (Section 4.2.2.4) On Days 1-14 of repeated 21-day cycles <b>Or</b> On Days 1-21 of repeated 28-day cycles		

- *Continued treatment: Autologous stem cell transplant*

For patients who proceed to autologous stem cell transplant, hematopoietic stem cell mobilization should occur within 4 cycles of initial therapy.

**4.2.1.1.2 Newly Diagnosed Multiple Myeloma Transplant ineligible – Revlimid in combination with dexamethasone**

Revlimid treatment in combination with dexamethasone must not be started if ANC < 1.5 x 10<sup>9</sup>/L, and platelet count < 50 x 10<sup>9</sup>/L.

For NDMM patients, CBC should be assessed every 7 days (weekly) for the first 2 cycles, every 2 weeks (Days 1 and 15) of cycle 3, and every 28 days (4 weeks) thereafter.

Patients should continue Revlimid and dexamethasone therapy until disease progression or intolerance. Dosing is continued or modified based upon clinical and laboratory findings.

**Recommended Starting Dose**

Patient Group	Revlimid	Dexamethasone
Patients ≤ 75 years of age with no renal impairment	25 mg once daily on Days 1-21 of repeated 28-day cycles.	40 mg once daily on Days 1, 8, 15 and 22 of repeated 28-day cycles
Patients > 75 years of age with no renal impairment	25 mg once daily on Days 1-21 of repeated 28-day cycles.	20 mg on Days 1, 8, 15 and 22 of repeated 28-day cycles
Patients with renal impairment	Revlimid dose as recommended in Table 1, Column 1 (Section 4.2.2.4), on Days 1-21 of repeated 28-day cycles	

Recommended dose adjustments for NDMM patients ineligible for transplant receiving Revlimid in combination with dexamethasone are found in Section 4.2.2 (Dose Adjustments).

**4.2.1.1.3 Newly Diagnosed Multiple Myeloma Post Transplant Maintenance – Revlimid Monotherapy**

Revlimid maintenance therapy should be initiated after adequate haematologic recovery following ASCT. Revlimid treatment must not be started if the ANC is < 1 x 10<sup>9</sup>/L, and/or platelet counts are < 75 x 10<sup>9</sup>/L. Patients should continue Revlimid therapy until disease progression or intolerance. Dosing is continued or modified based upon clinical and laboratory findings.

**Recommended Starting Dose**

Patient Group	Revlimid
Patients with no renal impairment	10 mg once daily continuously <sup>#</sup> on Days 1-28 of repeated 28-day cycles
Patients with renal impairment	As recommended in Table 1 Column 2 (Section 4.2.2.4). Once daily, continuously on Days 1-28 of repeated 28-day cycles

<sup>#</sup> After 3 months of maintenance therapy, the dose can be increased to 15 mg/day if tolerated

Recommended dose adjustments for NDMM post-transplant patients receiving Revlimid maintenance are found in Section 4.2.2 (Dose Adjustments).

**4.2.1.1.4 Previously Treated Multiple Myeloma - Revlimid in combination with dexamethasone**

Revlimid treatment must not be started if the ANC < 1.0 x 10<sup>9</sup>/L, and/or platelet counts < 75 x 10<sup>9</sup>/L or, dependent on bone marrow infiltration by plasma cells, platelet counts < 30 x 10<sup>9</sup>/L.

For patients with previously treated MM, CBC (including white blood cell count with differential count, platelet count), haemoglobin, and haematocrit should be performed at baseline, every 2 weeks for the first 12 weeks of Revlimid treatment, and monthly thereafter to monitor for cytopenias.

Treatment should be continued until disease progression or unacceptable toxicity. Dosing is continued or modified based upon clinical and laboratory findings.

### Recommended Starting Dose

Patient Group	Revlimid	Dexamethasone
Patients with no renal impairment	25 mg once daily on Days 1-21 of repeated 28-day cycles.	40 mg once daily on Days 1-4, 9-12 and 17-20 of repeated 28-day cycles for the first 4 cycles of therapy <sup>^</sup>
Patients with renal impairment	Revlimid dose as recommended in Table 1, Column 1 (Section 4.2.2.4), on Days 1-21 of repeated 28-day cycles.	

<sup>^</sup> From cycle 5 onwards 40 mg orally once daily on Days 1-4 of repeated 28-day cycles

Recommended dose adjustments for previously treated MM patients are found in Section 4.2.2 (Dose Adjustments).

#### 4.2.2.2 Myelodysplastic Syndromes - Revlimid monotherapy

Revlimid treatment must not be started if the ANC < 0.5 x 10<sup>9</sup>/L, and/or platelet counts < 50 x 10<sup>9</sup>/L.

For patients on therapy for the approved MDS indication, CBC should be monitored weekly for the first 8 weeks of therapy and at least monthly thereafter.

Dosing is continued or modified based upon clinical and laboratory findings.

### Recommended Starting Dose

Patient Group	Revlimid
Patients with no renal impairment	10 mg once daily on Days 1-21 of repeated 28-day cycles.
Patients with renal impairment	As recommended in Table 1, Column 2 (Section 4.2.2.4), Once daily, on Days 1-21 of repeated 28-day cycles.

Recommended dose adjustments for MDS patients are found in Section 4.2.2 (Dose Adjustments).

#### 4.2.2.3 Previously Treated Mantle Cell Lymphoma – Revlimid monotherapy

For MCL patients treated with Revlimid, CBC monitoring is recommended weekly for the first cycle (28 days), every 2 weeks during cycles 2-4, and then at the start of each cycle thereafter.

Treatment should be continued until disease progression or unacceptable toxicity. Dosing is continued or modified based upon clinical and laboratory findings.

### Recommended Starting Dose

Patient Group	Revlimid
Patients with no renal impairment	25 mg once daily on Days 1-21 of repeated 28-day cycles.
Patients with renal impairment	As recommended in Table 1, Column 1 (Section 4.2.2.4), Once daily, on Days 1-21 of repeated 28-day cycles.

Recommended dose adjustments for MCL patients are found in Section 4.2.2 (Dose Adjustments).

#### 4.2.2.4 Recommended starting dose for Renal impairment – All Indication

Lenalidomide is substantially excreted by the kidney. For patients with impaired renal function, care should be taken in dose selection. Monitoring of renal function is advised in patients with renal

impairment. The following starting doses of Revlimid are recommended for patients with impaired renal function, or end stage renal disease.

**Table 1. Recommended Starting Dose for Renal Impairment**

Renal Function (CLcr)	Recommended Starting Dose of Revlimid <sup>#</sup>	
	When the normal recommended starting dose of Revlimid is 25 mg once daily	When the normal recommended starting dose of Revlimid is 10 mg once daily
	Column 1	Column 2
Normal renal function / mild renal impairment (≥ 60 mL/min)	25 mg once daily (no dose adjustment)	10 mg once daily (no dose adjustment)
Moderate renal impairment (30 ≤ CLcr < 60 mL/min)	10 mg once daily*	5 mg once daily
Severe renal impairment (CLcr < 30 mL/min, not requiring dialysis)	15 mg every other day	5 mg every other day
End Stage Renal Disease (ESRD) (CLcr < 30 mL/min, requiring dialysis)	5 mg once daily On dialysis days, the dose should be administered following dialysis	5 mg, 3 times a week following each dialysis

CLcr = creatinine clearance.

\* The dose may be escalated to 15 mg once daily after 2 cycles if patient is not responding to treatment and is tolerating the treatment.

# Dosing should be per the recommended repeated cycles for each indication

After initiation of Revlimid therapy, subsequent Revlimid dose modifications should be based on individual patient treatment tolerance. Patients with impaired renal function should be monitored for signs and symptoms of neutropenia or thrombocytopenia as per the recommendations in Section 4.4. (Special warnings and Precautions for Use).

#### 4.2.2 Dose Adjustments

Dose adjustments, as summarised below, are recommended to manage Grade 3 or 4 neutropenia or thrombocytopenia, or other Grade 3 or 4 toxicities judged to be related to lenalidomide.

For dose adjustments due to toxicity with either bortezomib or dexamethasone, refer to the respective Product Information document. The recommended dose adjustments for Revlimid are provided below.

##### 4.2.2.1 Thrombocytopenia and/or Neutropenia

###### 4.2.2.1.1 Multiple Myeloma

###### Newly Diagnosed Multiple Myeloma – Revlimid in combination with bortezomib and dexamethasone

- Dose Reduction Levels**

	Revlimid
Starting dose	25 mg
Dose Level 1	20 mg
Dose Level 2	15 mg
Dose Level 3	10 mg
Dose Level 4	5 mg
Dose Level 5	Discontinue Revlimid

- *Dose Reduction Guidance*

<b>Thrombocytopenia</b>	
<b>When platelets:</b>	<b>Recommended Revlimid Course</b>
First fall to < 30 x 10 <sup>9</sup> /L	Interrupt treatment and follow CBC weekly
Return to ≥ 50 x 10 <sup>9</sup> /L	Resume at Dose Level 1
For each subsequent drop < 30 x 10 <sup>9</sup> /L	Interrupt treatment
Return to ≥ 50 x 10 <sup>9</sup> /L	Resume at next lower dose level.

<b>Neutropenia<sup>a</sup></b>	
<b>When neutrophils:</b>	<b>Recommended Revlimid Course</b>
First fall to < 0.5 x 10 <sup>9</sup> /L or febrile neutropenia [< 1.0 x 10 <sup>9</sup> /L associated with fever (temperature ≥ 38.5°C)]	Interrupt treatment.
Return to 1.0 x 10 <sup>9</sup> /L when neutropenia is the only observed toxicity	Resume at Dose Level 1.
For each subsequent drop below 0.5 x 10 <sup>9</sup> /L or febrile neutropenia	Interrupt treatment.
Return to ≥ 1.0 x 10 <sup>9</sup> /L	Resume at next lower Dose level.

<sup>a</sup> If neutropenia occurred, add granulocyte colony stimulating factor (G-CSF) to subsequent chemotherapy cycles.

*Newly Diagnosed Multiple Myeloma Transplant Ineligible – Revlimid in combination with dexamethasone*

- *Dose Reduction Levels*

	<b>Revlimid</b>	<b>Dexamethasone</b>
<b>Starting dose</b>	25 mg	40 mg
<b>Dose Level 1</b>	20 mg	20 mg
<b>Dose Level 2</b>	15 mg	12 mg
<b>Dose Level 3</b>	10 mg	8 mg
<b>Dose Level 4</b>	5 mg	4 mg
<b>Dose Level 5</b>	2.5 mg	Not applicable

- *Dose Reduction Guidance*

<b>Thrombocytopenia</b>	
<b>When platelets:</b>	<b>Recommended Revlimid Course</b>
First fall to < 25 x 10 <sup>9</sup> /L	Stop dosing for remainder of cycle <sup>a</sup>
Return to ≥ 50 x 10 <sup>9</sup> /L	Decrease by one dose level when dosing is resumed at next cycle. Do not dose below 2.5 mg daily

<b>Neutropenia<sup>b</sup></b>	
<b>When neutrophils:</b>	<b>Recommended Revlimid Course</b>
First fall to < 0.5 x 10 <sup>9</sup> /L or < 1.0 x 10 <sup>9</sup> /L associated with fever (temperature ≥ 38.5°C)	Interrupt treatment
Return to 1.0 x 10 <sup>9</sup> /L when neutropenia is the only observed toxicity	Resume at Starting Dose

Return to $\geq 0.5 \times 10^9/l$ when dose-dependent haematological toxicities other than neutropenia are observed	Resume at Dose Level 1 once daily
For each subsequent drop below $0.5 \times 10^9/L$	Interrupt treatment
Return to $\geq 0.5 \times 10^9/L$	Resume at next lower dose level once daily. Do not dose below 2.5 mg daily

a: If dose-limiting toxicity occurs on > Day 15 of a cycle, Revlimid dosing will be interrupted for at least the remainder of the current 28-day cycle.

b: At the physician's discretion, if neutropenia is the only toxicity at any dose level, treat the patient with granulocyte colony stimulating factor (G-CSF) and maintain the dose level of Revlimid.

If the dose of Revlimid was reduced for a haematologic dose-limiting toxicity (DLT), the dose of Revlimid may be re-increased to the next higher dose level (up to the starting dose) at the discretion of the treating physician if continued Revlimid/dexamethasone (Rev/dex) therapy resulted in improved bone marrow function (no DLT for at least 2 consecutive cycles and an ANC  $\geq 1.5 \times 10^9/L$  with a platelet count  $\geq 100 \times 10^9/L$  at the beginning of a new cycle at the current dose level).

### Newly Diagnosed Multiple Myeloma Post Transplant Maintenance – Revlimid

- Dose Reduction Levels**

	Revlimid Starting dose (10 mg)	If Revlimid dose increased (15 mg)*
<b>Dose Level 1</b>	5 mg (Days 1-28 of 28-day cycle)	10 mg (Days 1-28 of 28-day cycle)
<b>Dose Level 2</b>	5 mg (Days 1-21 of 28-day cycle)	5 mg (Days 1-28 of 28-day cycle)
<b>Dose Level 3</b>	Not applicable	5 mg (Days 1-21 of 28-day cycle)
	Do not dose below 5 mg (Days 1-21 of 28-day cycle)	

\*After 3 cycles of Revlimid maintenance, the dose can be increased to 15 mg if tolerated

- Dose Reduction Guidance**

<b>Thrombocytopenia</b>	
When platelets:	Recommended Revlimid Course
First fall to $< 30 \times 10^9/L$	Interrupt treatment
Return to $\geq 30 \times 10^9/L$	Resume at Dose Level 1 once daily
For each subsequent drop below $30 \times 10^9/L$	Interrupt treatment
Return to $\geq 30 \times 10^9/L$	Resume at next lower dose level once daily
<b>Neutropenia<sup>a</sup></b>	
When neutrophils:	Recommended Revlimid Course
First fall to $< 0.5 \times 10^9/L$	Interrupt treatment
Return to $\geq 0.5 \times 10^9/L$	Resume at Dose Level 1 once daily
For each subsequent drop below $0.5 \times 10^9/L$	Interrupt treatment
Return to $\geq 0.5 \times 10^9/L$	Resume at next lower dose level once daily

a: At the physician's discretion, if neutropenia is the only toxicity at any dose level, add G-CSF and maintain the dose level of Revlimid.

### Previously Treated Multiple Myeloma - Revlimid in combination with dexamethasone

- Dose Reduction Levels**

	Revlimid
<b>Starting dose</b>	25 mg
<b>Dose Level 1</b>	15 mg
<b>Dose Level 2</b>	10 mg
<b>Dose Level 3</b>	5 mg

- *Dose Reduction Guidance*

Thrombocytopenia	
When platelets:	Recommended Revlimid Course
First fall to $< 30 \times 10^9/L$	Interrupt treatment
Return to $\geq 30 \times 10^9/L$	Resume at Dose Level 1
For each subsequent drop below $30 \times 10^9/L$	Interrupt treatment
Return to $\geq 30 \times 10^9/L$	Resume at next lower dose level once daily.

Neutropenia <sup>a</sup>	
When neutrophils:	Recommended Revlimid Course
First fall to $< 0.5 \times 10^9/L$	Interrupt treatment
Return to $0.5 \times 10^9/L$ when neutropenia is the only observed toxicity	Resume at Starting Dose
Return to $\geq 0.5 \times 10^9/L$ when dose-dependent haematological toxicities other than neutropenia are observed	Resume at Dose Level 1 once daily
For each subsequent drop below $0.5 \times 10^9/L$	Interrupt treatment
Return to $\geq 0.5 \times 10^9/L$	Resume at next lower dose level once daily. Do not dose below 5 mg once daily.

a: In case of neutropenia, the physician should consider the use of growth factors in patient management.

#### 4.2.2.1.2 Myelodysplastic Syndromes-Revlimid monotherapy

- *Dose Reduction Guidance*

For patients with MDS, dose reduction guidelines are divided into 2 sets - for within the first 4 weeks of treatment, and after the first 4 weeks of treatment.

i). For patients who experience thrombocytopenia or neutropenia within the first 4 weeks of treatment:

Thrombocytopenia		
When baseline:	When platelets:	Recommended Revlimid Course
Platelet count $\geq 100 \times 10^9/L$	Fall to $< 50 \times 10^9/L$	Interrupt treatment
	Return to $\geq 50 \times 10^9/L$	Resume at 5 mg/day
Platelet count $\geq 60 \times 10^9$ and $< 100 \times 10^9/L$	Fall by 50% of the baseline value	Interrupt treatment
	Return to $\geq 50 \times 10^9/L$	Resume at 5 mg/day
Platelet count $< 60 \times 10^9/L$	Fall by 50% of the baseline value	Interrupt treatment
	Return to $\geq 30 \times 10^9/L$	Resume at 5 mg/day

Neutropenia		
When baseline:	When neutrophils:	Recommended Revlimid Course
ANC $\geq 1 \times 10^9/L$	Fall to $< 0.75 \times 10^9/L$	Interrupt treatment
	Return to $\geq 1 \times 10^9/L$	Resume at 5 mg/day
ANC $< 1 \times 10^9/L$	Fall to $< 0.5 \times 10^9/L$	Interrupt treatment
	Return to $\geq 0.5 \times 10^9/L$	Resume at 5 mg/day

ii). For patients who experience thrombocytopenia or neutropenia after the first 4 weeks of treatment:

<b>Thrombocytopenia</b>	
<b>During treatment at 10 mg/day:</b>	
<b>When platelets:</b>	<b>Recommended Revlimid Course</b>
Fall to $< 30 \times 10^9/L$ or $< 50 \times 10^9/L$ with platelet transfusions	Interrupt treatment
Return to $\geq 30 \times 10^9/L$ (without haemostatic failure)	Resume at 5 mg/day

<b>During treatment at 5 mg/day:</b>	
Fall to $< 30 \times 10^9/L$ or $< 50 \times 10^9/L$ with platelet transfusions	Interrupt treatment
Return to $\geq 30 \times 10^9/L$ (without haemostatic failure)	Resume at 5 mg/day every other day

<b>Neutropenia</b>	
<b>During treatment at 10 mg/day:</b>	
<b>When neutrophils:</b>	<b>Recommended Revlimid Course</b>
Fall to $< 0.5 \times 10^9/L$ for $\geq 7$ days or to $< 0.5 \times 10^9/L$ associated with fever (temperature $\geq 38.5^\circ C$ )	Interrupt treatment
Return to $\geq 0.5 \times 10^9/L$	Resume at 5 mg/day

<b>During treatment at 5 mg/day:</b>	
Fall to $< 0.5 \times 10^9/L$ for $\geq 7$ days or to $< 0.5 \times 10^9/L$ associated with fever (temperature $\geq 38.5^\circ C$ )	Interrupt treatment
Return to $\geq 0.5 \times 10^9/L$	Resume at 5 mg every other day

#### 4.2.2.1.3 Previously Treated Mantle Cell Lymphoma – Revlimid monotherapy

- Dose Reduction Guidance**

<b>Thrombocytopenia</b>	
<b>When platelets:</b>	<b>Recommended Revlimid Course</b>
First fall to $< 50 \times 10^9/L$	Interrupt treatment
Return to $\geq 60 \times 10^9/L$	Resume at 20 mg/day
For each subsequent drop below $50 \times 10^9/L$	Interrupt treatment
Return to $\geq 60 \times 10^9/L$	Resume at 5 mg less than the previous dose once daily. After 5 mg daily dose, resume at 5 mg every other day. Do not dose below 5 mg every other day.

<b>Neutropenia</b>	
<b>When neutrophils:</b>	<b>Recommended Revlimid Course</b>
First fall to $< 1.0 \times 10^9/L$ for at least 7 days OR Fall to $< 1.0 \times 10^9/L$ with associated fever (body temperature $\geq 38.5^\circ C$ ) OR Fall to $< 0.5 \times 10^9/L$	Interrupt treatment
Return to $\geq 1 \times 10^9/L$	Resume at 20 mg/day
For each subsequent drop below $< 1.0 \times 10^9/L$ for at least 7 days or drop to $< 1.0 \times 10^9/L$ with associated fever ( $\geq 38.5^\circ C$ ) or drop to $< 0.5 \times 10^9/L$	Interrupt treatment

Neutropenia	
<b>When neutrophils:</b>	<b>Recommended Revlimid Course</b>
Return to $\geq 1.0 \times 10^9/L$	Resume at 5 mg lower than the previous dose. After 5 mg daily dose, resume at 5 mg every other day. Do not dose below 5 mg every other day.

#### 4.2.2.2 Recommended Dose adjustments – All Indications

Other	
Thromboembolism	If a patient experiences any thromboembolic events, treatment must be discontinued and standard anticoagulation therapy started. Once the patient has been stabilised on the anticoagulation treatment and any complications of the thromboembolic event have been managed, the Revlimid treatment may be restarted at the original dose dependent upon a benefit-risk assessment. The patient should continue anticoagulation therapy during the course of Revlimid treatment.
Tumour Flare Reaction (TFR)	In patients with Grade 3 or 4 TFR, withhold treatment with Revlimid until TFR resolves to $\leq$ Grade 1. Patients may be treated for management of symptoms per the guidance for treatment of Grade 1 and 2 TFR.
Dermatological Reactions	Revlimid interruption or discontinuation should be considered for Grade 2-3 skin rash. Revlimid must be discontinued for angioedema, anaphylaxis, Grade 4 rash, exfoliative or bullous rash, or if Stevens-Johnson syndrome, toxic epidermal necrolysis or DRESS is suspected. Revlimid should not be resumed following the discontinuation for these reactions.
Hepatic impairment	Revlimid has not formally been studied in patients with impaired hepatic function and there are no specific dose recommendations.
Hepatic Disorders	If abnormal liver function test results are reported, treatment with Revlimid should be interrupted. Once parameters have returned to baseline, treatment at a lower dose may be considered.
Other Grade 3/4 Toxicities	For other Grade 3/4 toxicities judged to be related to Revlimid, stop treatment and restart at next lower dose level when toxicity has resolved to $\leq$ Grade 2, at the physician's discretion.

### 4.3 CONTRAINDICATIONS

- Women who are pregnant.
- Women of childbearing potential unless all of the conditions of the *i-access*<sup>®</sup> Program are met [see Section 4.4.1. (Pregnancy Warning)].
- Hypersensitivity to the active substance or to any of the excipients.

### 4.4 SPECIAL WARNINGS AND PRECAUTIONS FOR USE

**When Revlimid is given in combination with other medicinal products, the corresponding Product Information documents must be consulted prior to initiation of treatment.**

#### 4.4.1 Pregnancy Warning

Do not use Revlimid during pregnancy. Lenalidomide, a thalidomide analogue, caused limb abnormalities in a developmental monkey study. Thalidomide is a known human teratogen that causes severe life-threatening human birth defects. If lenalidomide is used during pregnancy, it may cause birth defects or embryo-fetal death.

To avoid embryo-fetal exposure to lenalidomide, Revlimid is only available through the *i-access*® program.

#### 4.4.1.1 The *i-access*® Program Conditions for Pregnancy Prevention

Revlimid is available under a restricted distribution program (*i-access*®). Only physicians and pharmacists registered with this Program can prescribe and dispense the product. In addition, Revlimid must only be dispensed to patients who are registered and meet all the conditions of the Program.

##### 4.4.1.1.1 Females of Non-Childbearing Potential

A female patient or a female partner of a male patient is considered to have childbearing potential **unless** she meets at least one of the following criteria:

- Age  $\geq$  50 years and naturally amenorrhoeic for  $\geq$  1 year\*
- Premature ovarian failure confirmed by a specialist gynaecologist
- Previous bilateral salpingo-oophorectomy, or hysterectomy
- XY genotype, Turner syndrome, uterine agenesis.

\*Amenorrhoea following cancer therapy does not rule out childbearing potential.

Female patients of non-childbearing potential are only required to comply with the General Conditions listed within the *i-access*® Program (see Section 4.4.1.1.5).

##### 4.4.1.1.2 Females of Childbearing Potential

Female patients of childbearing potential must comply with the following requirements on counselling, contraception and pregnancy testing.

If pregnancy occurs in a female patient treated with Revlimid, treatment must be stopped and the patient should be referred to a physician specialised or experienced in teratology for evaluation and advice. Similarly, if pregnancy occurs in a partner of a male patient taking Revlimid, the female partner should be referred to a physician specialised or experienced in teratology for evaluation and advice.

#### Counselling

For female patients of childbearing potential, Revlimid is contraindicated unless all of the following are met:

- She understands the potential teratogenic risk to the unborn child.
- She understands and agrees to comply with the need for effective contraception, without interruption, 4 weeks before starting treatment, throughout the entire duration of treatment, and 4 weeks after the end of treatment.
- Even if a female of childbearing potential has amenorrhea, she must follow all the advice on effective contraception.
- She should be capable of complying with effective contraceptive measures.
- She is informed and understands the potential consequences of pregnancy and the need to rapidly consult her physician if there is a risk of pregnancy.
- She understands the need to commence the treatment as soon as Revlimid is dispensed following a negative pregnancy test.
- She understands the need and accepts to undergo medically supervised pregnancy testing every 4 weeks.
- She acknowledges that she understands the hazards and necessary precautions associated with the use of Revlimid.

## Contraception

Female patients of childbearing potential must use one effective method of contraception for 4 weeks before therapy, during therapy, and until 4 weeks after Revlimid therapy, even in case of dose interruption, unless the patient commits to absolute and continuous abstinence confirmed on a monthly basis. If not established on effective contraception, the patient must be referred to an appropriately trained health care professional for contraceptive advice in order that contraception can be initiated.

**Table 2. Recommended Methods of Contraception**

<b>Contraceptive method</b>	<b>Comments</b>
Contraceptive implant	Contraceptive implants and levonorgestrel-releasing intrauterine systems are associated with an increased risk of infection at the time of insertion and irregular vaginal bleeding. Prophylactic antibiotics should be considered particularly in patients with neutropenia.  Copper-releasing intrauterine devices are generally not recommended due to the potential risks of infection at the time of insertion and menstrual blood loss which may compromise patients with neutropenia or thrombocytopenia.
Levonorgestrel-releasing intrauterine system (IUS)	
Medroxyprogesterone acetate depot	
Tubal ligation	
Sexual intercourse with a vasectomised male partner only	Vasectomy must be confirmed by two negative semen analyses.
Ovulation inhibitory progesterone-only pills (i.e. desogestrel).	Because of the increased risk of venous thromboembolism in MM patients taking Rev/dex, and to a lesser extent in patients with MM, MDS or MCL taking Revlimid monotherapy, combined oral contraceptive pills are not recommended. If a patient is currently using combined oral contraception, the patient should switch to one of the effective methods listed in this table. The risk of venous thromboembolism continues for 4-6 weeks after discontinuing combined oral contraception. The efficacy of contraceptive steroids may be reduced during co-treatment with dexamethasone.

## Pregnancy testing

Medically supervised pregnancy tests with a minimum sensitivity of 25 mIU/mL must be performed for females of childbearing potential as outlined below.

This requirement includes females of childbearing potential who practice absolute and continuous abstinence. Ideally, pregnancy testing, issuing a prescription and dispensing should occur on the same day. For females of childbearing potential, dispensing of Revlimid must occur within a maximum of 7 days of the negative pregnancy test.

- *Prior to Starting Treatment*

A medically supervised pregnancy test should be performed when Revlimid is prescribed. The test should occur either at the time of consultation, or in the 3 days prior to the visit to the prescriber and at a point where the patient has been using effective contraception for at least 4 weeks. The test should ensure the patient is not pregnant when she starts treatment with Revlimid. This requirement includes females of childbearing potential who practice absolute and continuous abstinence.

- Follow-up and End of Treatment

A medically supervised pregnancy test should be repeated every 4 weeks, including 4 weeks after the end of treatment. These pregnancy tests should be performed on the day of the prescribing visit or in the 3 days prior to the visit to the prescriber. This requirement includes females of childbearing potential who practice absolute and continuous abstinence.

#### 4.4.1.1.3 Male Patients

Male patients must comply with the following requirements on counselling and contraception as clinical data has demonstrated the presence of lenalidomide in human semen.

#### Counselling and contraception

- He understands the potential teratogenic risk if engaged in sexual activity with a female of childbearing potential.
- He understands and complies with the need for the use of a condom (if engaged in sexual activity with a female of childbearing potential) throughout treatment duration, during dose interruption, and for 1 week after cessation of treatment if his partner is of childbearing potential and has no contraception.
- He understands that if his partner becomes pregnant whilst he is taking Revlimid or during the 1st week after he discontinues taking Revlimid, he should inform his treating physician immediately.
- He understands that he must not donate sperm during therapy (including during dose interruptions) or for 1 week following discontinuation of Revlimid.

#### 4.4.1.1.4 Prescribers

- Ensure that female patients of childbearing potential comply with the conditions of the *i-access*<sup>®</sup> Program, including confirmation that the patients have an adequate level of understanding of the Program requirements.
- Provide full patient information about the potential teratogenic risk and the strict pregnancy prevention measures as specified in the *i-access*<sup>®</sup> Program to female patients of childbearing potential and, as appropriate, to male patients.
- Ensure that all patients acknowledge and agreed to comply with the aforementioned conditions of the *i-access*<sup>®</sup> Program.

#### 4.4.1.1.5 General conditions

All patients should be instructed never to give this medicinal product to another person and to return any unused capsules to their pharmacist at the end of treatment.

All patients should not donate blood during therapy (including during dose interruptions), or for 1 week following discontinuation of Revlimid. In Australia, patients with a history of cancers that involve the haematopoietic system directly e.g. myeloma and lymphoma, are permanently excluded from donating blood.

### 4.4.2 Myocardial Infarction

Myocardial infarction has been reported in patients receiving Revlimid, particularly in those with known risk factors. Patients with known risk factors (including prior thrombosis) should be closely monitored, and action should be taken to try to minimise all modifiable risk factors (e.g. smoking, hypertension, and hyperlipidaemia).

### 4.4.3 Venous and Arterial Thromboembolism

In patients with MM, the combination of Rev/dex is associated with an increased risk of venous thromboembolism [VTE (predominantly DVT and PE)].

In patients with MM, MDS or MCL, treatment with Revlimid monotherapy was associated with a lower risk of VTE (predominantly DVT and PE) than in MM patients treated with Revlimid in combination therapy.

In patients with MM, the combination of Rev/dex is associated with an increased risk of arterial thromboembolism [ATE (predominantly myocardial infarction and cerebrovascular event)]. The risk of ATE is lower in MM patients treated with Revlimid monotherapy than in MM patients treated with Revlimid in combination therapy.

Patients with known risk factors for thromboembolism (including prior thrombosis) should be closely monitored, and action should be taken to try to minimise all modifiable risk factors (e.g. smoking, hypertension, and hyperlipidaemia). Concomitant administration of erythropoietic agents or previous history of DVT may also increase thrombotic risk in these patients. Therefore, erythropoietic agents, or other agents that may increase the risk of thrombosis, such as hormone replacement therapy, should be used with caution in MM patients receiving Rev/dex. A haemoglobin concentration above 120 g/L should lead to discontinuation of erythropoietic agents.

Patients and physicians are advised to be observant for the signs and symptoms of thromboembolism. Patients should be instructed to seek medical care if they develop symptoms such as shortness of breath, chest pain, arm or leg swelling. Prophylactic antithrombotic medicines, such as low molecular weight heparins or warfarin, should be recommended, especially in patients with additional thrombotic risk factors. The decision to take antithrombotic prophylactic measures should be made after careful assessment of an individual patient's underlying risk factors.

If a patient experiences any thromboembolic events, treatment must be discontinued and standard anticoagulation therapy started. Once the patient has been stabilised on the anticoagulation treatment and any complications of the thromboembolic event have been managed, Revlimid treatment may be restarted at the original dose dependent upon a benefit-risk assessment. The patient should continue anticoagulation therapy during the course of Revlimid treatment.

#### **4.4.4 Neutropenia and Thrombocytopenia**

The major dose-limiting toxicities of lenalidomide include neutropenia and thrombocytopenia. Patients with neutropenia should be monitored for signs of infection. Patients should be advised to promptly report febrile episodes. Patients and physicians are advised to be observant for signs and symptoms of bleeding, including petechiae and epistaxis, especially with use of concomitant medication that may increase risk of bleeding. Therefore, co-administration of Revlimid with other myelosuppressive agents should be undertaken with caution. Appropriate management should be instituted if such toxicity is observed. Patients taking Revlimid should have their complete blood counts (CBC) assessed periodically as described below. A dose interruption and/or dose reduction may be required.

##### **4.4.4.1 Newly Diagnosed Multiple Myeloma – Revlimid in combination with bortezomib and dexamethasone**

Complete blood count assessed every 7 days (weekly) for the first cycle, then prior to the start of each subsequent cycle if Revlimid is used in combination with bortezomib and dexamethasone. With continued use of Revlimid in combination with dexamethasone, monitor monthly (every 4 weeks). Dose interruptions and/or dose reductions may be required.

##### **4.4.4.2 Newly Diagnosed Multiple Myeloma - Transplant Ineligible – Revlimid in combination with dexamethasone**

For NDMM patients, CBC should be assessed every 7 days (weekly) for the first 2 cycles, every 2 weeks (Days 1 and 15) of cycle 3, and every 28 days (4 weeks) thereafter.

#### **4.4.4.3 Previously Treated Multiple Myeloma - Revlimid in combination with dexamethasone**

The combination of Rev/dex in previously treated MM patients is associated with a higher incidence of Grade 4 neutropenia (4.8% in Rev/dex-treated patients compared with 0.6% in placebo/dex-treated patients. Grade 4 febrile neutropenia episodes were observed infrequently [0.6% in Rev/dex-treated patients compared to 0.0% in placebo/dex-treated patients; see Section 4.8. (Adverse Effects)]. A dose reduction may be required. In case of neutropenia, the physician should consider the use of growth factors in patient management.

The combination of Rev/dex in previously treated MM patients is associated with a higher incidence of Grade 3 and Grade 4 thrombocytopenia [10.8% and 1.4%, respectively, in Rev/dex-treated patients compared to 5.4% and 0.9% in placebo/dex-treated patients; see Section 4.8. (Adverse Effects)].

For patients with previously treated MM, CBC (including white blood cell count with differential count), platelet count, haemoglobin, and haematocrit should be performed at baseline, every 2 weeks for the first 12 weeks of Revlimid treatment and monthly thereafter to monitor for cytopenias.

#### **4.4.4.4 Myelodysplastic Syndromes- Revlimid monotherapy**

In clinical studies of patients with del 5q MDS, Revlimid as monotherapy was associated with significant neutropenia and thrombocytopenia. Grade 3 or 4 haematologic toxicity was seen in 80% of patients. In the 48% of patients who developed Grade 3 or 4 neutropenia, the median time to onset was 42 days (range, 14-411 days), and the median time to documented recovery was 17 days (range, 2-170 days). In the 54% of patients who developed Grade 3 or 4 thrombocytopenia, the median time to onset was 28 days (range, 8-290 days), and the median time to documented recovery was 22 days (range, 5-224 days).

Patients on therapy for del 5q MDS should have their CBC monitored weekly for the first 8 weeks of therapy and at least monthly thereafter. Patients may require dose interruption and/or reduction. Patients may require the use of blood product support and/or growth factors.

#### **4.4.4.5 Previously Treated Mantle Cell Lymphoma – Revlimid monotherapy**

For MCL patients treated with Revlimid, CBC monitoring is recommended weekly for the first cycle (28 days), every 2 weeks during cycles 2-4, and then at the start of each cycle thereafter. A dose interruption and/or dose reduction may be required.

#### **4.4.5 Peripheral Neuropathy**

Lenalidomide is structurally related to thalidomide, which is known to induce severe peripheral neuropathy. There was no increase in peripheral neuropathy observed with long-term use of Revlimid for the treatment of newly diagnosed multiple myeloma.

The combination of Revlimid with intravenous bortezomib and dexamethasone in multiple myeloma patients was associated with a higher frequency of peripheral neuropathy. The frequency was lower when bortezomib was administered subcutaneously. For additional information, see Section 4.8 (Adverse Effects).

#### **4.4.6 Tumour Lysis Syndrome (TLS) and Tumour Flare Reaction (TFR)**

##### **4.4.6.1 Multiple Myeloma (MM) and Myelodysplastic Syndromes (MDS)**

There have been rare reports of TLS in patients with MM treated with Revlimid, and no reports in patients with MDS treated with Revlimid.

#### **4.4.6.2 Lymphomas, including Previously Treated Mantle Cell Lymphoma (MCL)**

TLS and TFR have commonly been observed in patients with chronic lymphocytic leukaemia (CLL), and uncommonly in patients with lymphomas, who were treated with Revlimid. Fatal instances of TLS have been reported during treatment with Revlimid. Patients at risk of TLS and TFR are those with high tumour burden prior to treatment. Caution should be practiced when introducing these patients to Revlimid. These patients should be monitored closely, especially during the first cycle or dose-escalation, and appropriate precautions taken.

There were no reports of TLS in Study MCL-001. In Study MCL-002, TLS was reported for one patient in each treatment arm.

In Study MCL-001, approximately 10% of subjects experienced TFR; all reports were Grade 1 or 2 in severity and all were assessed as treatment-related. The majority of the events occurred in cycle 1. In Study MCL-002, approximately 10% of Revlimid-treated patients experienced TFR compared to 0% in the control arm. The majority of the events occurred in cycle 1, all were assessed as treatment-related, and the majority of the reports were Grade 1 or 2.

Careful monitoring and evaluation for TFR is recommended. Tumour flare may mimic progression of disease. Revlimid may be continued in patients with Grade 1 and 2 TFR without interruption or modification, at the physician's discretion. Patients in Studies MCL-001 and MCL-002 that experienced Grade 1 and 2 TFR were treated with corticosteroids, non-steroidal anti-inflammatory drugs (NSAIDs) and/or narcotic analgesics for management of TFR symptoms. The decision to take therapeutic measures for TFR should be made after careful clinical assessment of the individual patient. In patients with Grade 3 or 4 TFR, withhold treatment with Revlimid until TFR resolves to  $\leq$  Grade 1 and patients may be treated for management of symptoms per the guidance for treatment of Grade 1 and 2 TFR.

#### **4.4.7 Allergic Reactions and Serious Skin Reactions**

Rare cases of angioedema, anaphylaxis and serious dermatological reactions including Stevens-Johnson syndrome toxic epidermal necrolysis and drug reaction with eosinophilia and systemic symptoms (DRESS) have been reported from post-marketing experience. DRESS may present with a cutaneous reaction (such as rash or exfoliative dermatitis), eosinophilia, fever, and/or lymphadenopathy with systemic complications such as hepatitis, nephritis, pneumonitis, myocarditis, and/or pericarditis. These events have the potential to be fatal.

Patients with a prior history of Grade 4 rash associated with thalidomide treatment should not receive Revlimid. Revlimid interruption or discontinuation should be considered for Grade 2-3 skin rash. Revlimid must be discontinued for angioedema, anaphylaxis, Grade 4 rash, exfoliative or bullous rash, or if Stevens-Johnson syndrome, toxic epidermal necrolysis or DRESS is suspected. Revlimid should not be resumed following the discontinuation for these reactions.

#### **4.4.8 Atrial Fibrillation**

In the two pivotal randomised controlled trials in previously treated (relapsed/refractory) MM patients, atrial fibrillation occurred in 14 (4.0%) subjects treated with Rev/dex compared to 4 (1.1%) subjects treated with placebo/dex (unadjusted for the longer on-study observation time for patients receiving Revlimid). Careful review of these cases revealed the presence of multiple risk factors for atrial fibrillation (e.g. infections, hypertension, congestive heart failure, electrolyte imbalance), and a causal relationship to Revlimid treatment has not yet been determined.

#### **4.4.9 Use in Patients with Impaired Thyroid Function**

Cases of hypothyroidism and hyperthyroidism have been reported. Optimal control of co-morbid conditions that can affect thyroid function is recommended before start of treatment. Baseline and ongoing monitoring of thyroid function is recommended.

#### **4.4.10 Use in Patients with Lactose Intolerance**

Revlimid capsules contain lactose. Patients with rare hereditary problems of galactose intolerance, the Lapp lactase deficiency or glucose-galactose malabsorption should not take Revlimid.

#### **4.4.11 Use in Hepatic impairment**

Hepatic failure, including fatal cases, has been reported in patients treated with Rev/dex. This includes reports of acute hepatic failure, toxic hepatitis, cytolytic hepatitis, cholestatic hepatitis, and mixed cytolytic/cholestatic hepatitis. The mechanisms of severe drug-induced hepatotoxicity remain unknown although, in some cases, pre-existing viral liver disease, elevated baseline liver enzymes, and possibly treatment with antibiotics might be risk factors.

Abnormal liver function tests have been commonly reported and were generally asymptomatic and reversible upon dosing interruption. Monitoring of liver function is recommended, particularly when there is a history of or concurrent viral liver infection, or when lenalidomide is combined with medications known to be associated with liver dysfunction. If abnormal liver function test results are reported, treatment with Revlimid should be interrupted. Once parameters have returned to baseline, treatment at a lower dose may be considered.

#### **4.4.12 Use in Renal impairment**

Lenalidomide is excreted by the kidneys. It is important to dose adjust patients with renal impairment in order to avoid plasma levels which may increase the risk for higher haematological side effects or hepatotoxicity.

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

Population pharmacokinetic analyses included patients with ages ranging from 39 to 85 years old and show that age does not influence the disposition of lenalidomide. No dose adjustments are needed for Revlimid.

For NDMM patients > 75 years of age and ineligible for ASCT, a reduced starting dose of dexamethasone is recommended.

Revlimid has been used in clinical trials in previously treated MM patients up to 86 years of age. The percentage of patients aged 65 or over was not significantly different between the Rev/dex and placebo/dex groups. No overall difference in effectiveness was observed between these patients and younger patients. However, overall serious adverse events (AEs), in particular the serious vascular events [including deep vein thrombosis (DVT) and pulmonary embolism (PE)] and serious cardiovascular events (including atrial fibrillation), were all more frequent in Revlimid-treated patients 65 years and over.

Revlimid has also been used in MDS clinical trials in patients up to 95 years of age. Of the 395 patients in the MDS clinical trials who received 10 mg Revlimid, 72.2% were aged 65 and over. No overall difference in safety was observed between these patients and younger patients, but greater pre-disposition of older individuals to drug-related toxicities cannot be ruled out.

Lenalidomide is known to be substantially excreted by the kidney. The risk of ADRs may be greater in patients with impaired renal function. Elderly patients are more likely to have decreased renal function, so care should be taken in dose selection for such patients. Renal function should therefore be monitored.

#### **4.4.14 Paediatric Use**

There is no experience in treating children and adolescents with Revlimid. Therefore, Revlimid should not be used in the paediatric age group (0-18 years).

#### **4.4.15 Second Primary Malignancies (SPM)**

In clinical trials in NDMM patients ineligible for ASCT, a 4.9-fold increase in incidence rate of haematologic second primary malignancies (SPM) (cases of AML and MDS) has been observed in patients receiving Revlimid in combination with melphalan and prednisone (MPR+R) until progression (1.75 per 100 person-years) compared with melphalan in combination with prednisone (MPp+p) (0.36 per 100 person-years). A 2.12-fold increase in incidence rate of solid tumour SPM has been observed in patients receiving MPR+R (9 cycles) (1.57 per 100 person-years) compared with MPp+p (0.74 per 100 person-years).

In NDMM patients receiving Revlimid in combination with dexamethasone (Rev/dex) until progression or for 18 months, the haematologic SPM incidence rate (0.16 per 100 person-years) was not increased as compared to thalidomide in combination with melphalan and prednisone (MPT) (0.79 per 100 person-years). A 1.3-fold increase in incidence rate of solid tumour SPM has been observed in patients receiving Rev/dex until progression or for 18 months (1.58 per 100 person-years) compared to MPT (1.19 per 100 person-years).

In clinical trials of NDMM patients eligible for ASCT, an increased incidence rate of haematologic SPM (most notably AML, MDS and B-cell malignancies [including Hodgkin's lymphoma] has been observed in patients receiving Revlimid maintenance immediately following high-dose melphalan/ASCT (1.31 per 100 person-years) compared with patients who received placebo (0.58 per 100 person-years). The incidence rate of solid tumour SPMs was 1.36 per 100 person-years for the Revlimid arms and 1.05 per 100 person-years for the placebo arms.

Based on a low number of cases, a numerical imbalance in SPM (comprising mainly of basal cell and squamous cell skin cancers) has been observed in clinical trials in previously treated MM patients with Rev/dex (3.98 per 100 patient-years) compared with placebo/dex (1.38 per 100 patient-years).

Subjects who received Revlimid-containing therapy until disease progression did not show a higher incidence of invasive SPM than subjects treated in the fixed duration lenalidomide-containing arms. These results suggest that duration of Revlimid treatment is not associated with an increased risk for the occurrence of invasive SPM.

Both the benefit achieved with Revlimid and the risk of SPMs should be considered and discussed with patients, before initiating treatment with the product. Physicians should also carefully evaluate patients before and during treatment using standard cancer screening for occurrence of SPMs and institute treatment as appropriate.

#### **4.4.16 Increased Mortality in Chronic Lymphocytic Leukaemia (CLL)**

In a prospective randomized (1:1) clinical trial in the first line treatment of patients with CLL, single agent Revlimid therapy was associated with an increased risk of death as compared to single agent chlorambucil. Revlimid is not recommended for use in CLL outside of controlled clinical trials.

#### **4.4.17 Progressive Multifocal Leukoencephalopathy**

Cases of progressive multifocal leukoencephalopathy (PML), including fatal cases, have been reported with Revlimid in combination with immunosuppressive therapy including dexamethasone. PML was reported several months to several years after starting the treatment with lenalidomide. Physicians should consider PML in the differential diagnosis in patients with new or worsening neurological, cognitive or behavioural signs or symptoms and appropriate diagnostic measures for PML are recommended. If PML is suspected, further lenalidomide dosing must be suspended until PML has been excluded. If PML is confirmed, lenalidomide must be permanently discontinued.

#### 4.4.18 Solid Organ Transplant

Cases of solid organ transplant (SOT) rejection have been reported in the post-market setting with the use of Revlimid and, in some cases, have resulted in a fatal outcome. Onset may be acute, occurring within 1 to 3 cycles of Revlimid treatment. The incidence rate of SOT rejection cannot be reliably estimated due to the limitation of post-marketing safety data and that patients with SOT were generally excluded from Celgene-sponsored Revlimid clinical trials. The benefit of treatment with Revlimid versus the risk of possible SOT rejection should be considered in patients with a history of SOT before initiating Revlimid therapy. Clinical and laboratory signs of SOT rejection should be closely monitored and Revlimid therapy should be discontinued in the event of SOT rejection.

#### 4.5 INTERACTIONS WITH OTHER MEDICINES AND OTHER FORMS OF INTERACTIONS

Erythropoietic agents, or other agents that may increase the risk of thrombosis, such as hormone replacement therapy, should be used with caution in MM patients receiving Rev/dex.

*In vitro*, lenalidomide does not inhibit UGT1A1-mediated bilirubin glucuronidation in human liver microsomes derived from donors representing genotypes UGT1A1\*1/\*1, UGT1A1\*1/\*28, and UGT1A1\*28/\*28.

The major dose-limiting toxicities of lenalidomide include neutropenia and thrombocytopenia. Therefore, co-administration of Revlimid with other myelosuppressive agents should be undertaken with caution.

##### 4.5.1 Oral Contraceptives

No interaction study has been performed with oral contraceptives. Lenalidomide is not an enzyme inducer (see below). Dexamethasone is known to be a weak to moderate inducer of CYP3A4 and is likely to also affect other enzymes as well as transporters. It may not be excluded that the efficacy of oral contraceptives may be reduced during treatment. Effective measures to avoid pregnancy must be taken.

Lenalidomide is not a substrate, inhibitor or inducer of cytochrome P450 enzymes *in vitro*. Hence, co-administration of cytochrome P450 substrates (including hormonal contraceptives), inhibitors or inducers with lenalidomide is not likely to result in clinically relevant drug-drug interactions.

However, it is noteworthy that there is an increased risk of VTE in patients treated with Revlimid in combination with dexamethasone for MM and to a lesser extent in patients treated with Revlimid monotherapy for MM, MDS or MCL. Since there is an increased risk of VTE in patients taking combined oral contraceptive pills or hormone replacement therapy, physicians should discuss the benefit/risk of contraceptive methods or hormone replacement with their patients. Effective measures to avoid pregnancy must be taken.

##### 4.5.2 Dexamethasone

In patients with MM, co-administration of single or multiple doses of dexamethasone (40 mg/day) had no significant effect on the multiple dose pharmacokinetics of lenalidomide (25 mg/day).

##### 4.5.3 Warfarin

Co-administration of multiple doses of 10 mg of Revlimid had no effect on the single dose pharmacokinetics of R- and S- warfarin. Co-administration of a single 25 mg dose of warfarin had no effect on the pharmacokinetics of lenalidomide. However, it is not known whether there is an interaction during clinical use (concomitant treatment with dexamethasone). Dexamethasone is a weak to moderate enzyme inducer and its effect on warfarin is unknown. Close monitoring of warfarin concentration is advised during the treatment.

#### 4.5.4 Digoxin

Concomitant administration with lenalidomide 10 mg/day increased the plasma exposure of digoxin (0.5 mg, single dose) by 14% [90% CI: 0.52%-28.2%]. It is not known whether the effect will be different in the therapeutic situation (higher Revlimid doses and concomitant treatment with dexamethasone). Therefore, monitoring of the digoxin concentration is advised during Revlimid treatment. In the same study, the co-administration of digoxin (a P-glycoprotein substrate) did not significantly affect the pharmacokinetics of lenalidomide.

#### 4.5.5 Human Efflux Transporters

Lenalidomide is a weak substrate but not an inhibitor of P-glycoprotein (P-gp). Co-administration of multiple doses of P-gp inhibitor, quinidine (600 mg, twice daily) had no effect on the single dose pharmacokinetics of lenalidomide (25 mg). Single dose co-administration of lenalidomide (25 mg) and P-gp inhibitor/substrate, temsirolimus (25 mg), does not affect the pharmacokinetics of either drug.

Lenalidomide is not an inhibitor of bile salt export pump (BSEP), MRP2, OAT1, OAT3, OATP1B1, OATP1B3, or OCT2.

#### 4.5.6 Renal Drug Interactions

Renal drug-drug interaction studies have not been performed. The renal clearance of lenalidomide is slightly greater than the glomerular filtration rate, suggesting that active secretion contributes to a minor extent ( $\leq 25\%$ ) of renal clearance. Hence, the inhibition of the active secretion of lenalidomide will most likely not result in a clinically relevant drug-drug interaction.

### 4.6 FERTILITY, PREGNANCY AND LACTATION

#### 4.6.1 Effects on Fertility

A fertility and early embryonic development study in male and female rats, with administration of lenalidomide up to 500 mg/kg/day, produced no parental toxicity and no adverse effects on fertility or early embryonic development. The systemic exposure in rats at 500 mg/kg was  $> 70$ -fold higher than the human exposure at 25 mg/day, based on AUC.

#### 4.6.2 Use in Pregnancy (Pregnancy Category X) (see Section 4.4.1)

For lenalidomide, no clinical data on exposed pregnancies are available. Because lenalidomide is a structural analogue of thalidomide (a known human teratogen that causes severe, life-threatening birth defects), and has shown teratogenic effects in animal studies, lenalidomide must not be used in pregnant women. Females of childbearing potential must use effective means of contraception.

Embryofoetal development studies were conducted in monkeys and rabbits. In monkeys, lenalidomide was teratogenic at systemic exposures (based on plasma AUC) well below that anticipated clinically, and a NOEL for the teratogenic effects could not be established in the study.

In rabbits treated with 3, 10 and 20 mg/kg/day orally, maternal and developmental toxicity was noted at  $\geq 10$  mg/kg/day. The toxicity was characterised by slightly reduced foetal body weights, increased incidences of post-implantation loss, and gross external findings in the foetuses associated with maternal toxicity of lenalidomide. Increased incidences of soft tissue and skeletal variations in the foetuses were also observed at 10 and 20 mg/kg/day. The NOEL for developmental toxicity of lenalidomide in rabbits was identified as 3 mg/kg/day, which is associated with a plasma AUC value equivalent to that anticipated clinically at the 25 mg/day dose in humans.

### 4.6.3 Use in Lactation

It is not known whether lenalidomide is excreted in human milk. Because of the potential for adverse drug reactions (ADRs) in nursing infants from lenalidomide, a decision should be made whether to discontinue nursing or to discontinue the medicine, taking into account the importance of the medicine to the mother.

### 4.7 EFFECTS ON ABILITY TO DRIVE AND USE MACHINES

No studies on the effects on the ability to drive and use machines have been performed. Lenalidomide may have minor or moderate influence on the ability to drive and use machines. Fatigue, dizziness, somnolence, vertigo and blurred vision have been reported with the use of Revlimid. Therefore, caution is recommended when driving or operating machines.

### 4.8 ADVERSE EFFECTS (UNDESIRABLE EFFECTS)

#### 4.8.1 Tabulated Summary of Adverse Events

##### 4.8.1.1 Multiple Myeloma (MM)

##### 4.8.1.1.1 Newly Diagnosed Multiple Myeloma – Revlimid in combination with bortezomib and dexamethasone

The most frequent adverse events with the Revlimid, bortezomib and dexamethasone combination across the 3 studies were in the System Organ Classes of Nervous System Disorders, Blood and Lymphatic System Disorders and Gastrointestinal Disorders. Compared with Revlimid and dexamethasone, the combination of Revlimid, bortezomib and dexamethasone was associated with increased incidences of treatment-emergent serious adverse events (40.1% Rbd vs. 28.5% Rd) and discontinuations due to treatment emergent AEs (22.9% Rbd vs. 9.4% Rd). Increases in the incidence of Grade 3/4 adverse events in the Rbd arm versus the Rd arm were most notable for peripheral sensory and motor neuropathy, thrombocytopenia, hypotension, diarrhoea, syncope, hypokalaemia and dehydration.

**Table 3. Treatment-Emergent Common Adverse Events Reported in  $\geq 10\%$  of Subjects in Studies SWOG-S0777, PETHEMA GEM2012 and IFM 2009 - Initial Treatment Period**

System Organ Class Preferred term*	% Frequency			
	SWOG-S0777		PETHEMA GEM2012 Pooled Arms A and B	IFM 2009 Arm A
	Revlimid + bortezomib + dex	Revlimid + dex	Revlimid + bortezomib + dex	Revlimid + bortezomib + dex
<b>Number of patients (N)</b>	<b>262</b>	<b>256</b>	<b>458</b>	<b>356</b>
<b>General disorders and administration site conditions</b>				
Fatigue	73.7	65.2	0	43.3
Oedema peripheral	46.6	25.4	< 10	25.3
Pyrexia	14.1	< 10	< 10	20.2
Chills	11.5	< 10	0	< 10
Asthenia	0	0	12.2	< 10
<b>Nervous system disorders</b>				
Peripheral sensory neuropathy	70.2	33.2	0	52.2
Dysgeusia	30.2	18.8	< 10	< 10
Dizziness	29.0	16.0	< 10	< 10
Peripheral motor neuropathy	16.4	< 10	0	< 10
Headache	10.7	< 10	< 10	15.4

System Organ Class Preferred term*	% Frequency			
	SWOG-S0777		PETHEMA GEM2012 Pooled Arms A and B	IFM 2009 Arm A
	Revlimid + bortezomib + dex	Revlimid + dex	Revlimid + bortezomib + dex	Revlimid + bortezomib + dex
Paraesthesia	< 10	< 10	< 10	22.5
Neuropathy peripheral	< 10	0	34.9	< 10
<b>Gastrointestinal disorders</b>				
Constipation	56.1	44.9	12.0	38.2
Diarrhoea	39.7	30.9	12.9	33.7
Nausea	37.4	27.0	< 10	30.6
Dyspepsia	19.1	12.9	0	< 10
Vomiting	17.6	12.9	< 10	15.4
Abdominal pain	13.0	< 10	0	< 10
Stomatitis	12.2	< 10	< 10	< 10
Dry mouth	11.5	< 10	< 10	< 10
<b>Blood and lymphatic system disorders</b>				
Anaemia	68.3	68.4	15.1	17.4
Thrombocytopenia	57.6	45.7	25.3	19.9
Leukopenia	41.6	49.2	< 10	36.0
Neutropenia	29.4	38.7	31.9	45.8
Lymphopenia	25.6	24.2	< 10	52.2
<b>Metabolism and nutrition disorders</b>				
Hypocalcaemia	50.0	43.4	0	< 10
Hyperglycaemia	48.5	55.5	< 10	< 10
Decreased appetite	34.4	23.0	< 10	< 10
Hyponatremia	30.5	25.4	< 10	< 10
Hypoalbuminemia	29.8	26.2	0	< 10
Hypokalaemia	29.0	20.7	< 10	< 10
Dehydration	16.4	< 10	0	0
Hypoglycaemia	10.7	< 10	0	< 10
<b>Musculoskeletal and connective tissue disorders</b>				
Back pain	33.2	27.7	< 10	19.1
Muscular weakness	24.4	17.6	< 10	< 10
Pain in Extremity	17.9	13.3	0	< 10
Arthralgia	16.4	16.4	0	< 10
Myalgia	14.9	10.5	< 10	< 10
Bone pain	< 10	12.1	< 10	11.8
Muscle spasms	< 10	< 10	< 10	15.7
<b>Investigations</b>				
Alanine aminotransferase increased	25.6	19.1	< 10	< 10
Blood alkaline phosphatase increased	25.2	18.8	< 10	< 10
Aspartate aminotransferase increased	21.4	14.8	< 10	< 10
Weight decreased	20.2	21.1	< 10	< 10
Blood creatinine increased	18.3	25.0	< 10	< 10
<b>Respiratory, thoracic and mediastinal disorders</b>				
Dyspnea	30.5	25.4	< 10	< 10
Cough	29.4	19.9	< 10	12.1
<b>Psychiatric disorders</b>				
Insomnia	32.8	28.9	< 10	24.2
Depression	11.8	11.3	< 10	< 10
Anxiety	< 10	12.1	< 10	< 10

System Organ Class Preferred term*	% Frequency			
	SWOG-S0777		PETHEMA GEM2012 Pooled Arms A and B	IFM 2009 Arm A
	Revlimid + bortezomib + dex	Revlimid + dex	Revlimid + bortezomib + dex	Revlimid + bortezomib + dex
<b>Infections and infestations</b>				
Infection	< 10	< 10	28.2	< 10
Bronchitis	< 10	< 10	< 10	10.4
Rhinitis	0	< 10	0	10.7
<b>Skin and subcutaneous tissue disorders</b>				
Rash	18.7	20.3	< 10	21.9
Dry skin	14.9	13.3	< 10	< 10
Pruritus	< 10	14.1	< 10	< 10
<b>Vascular disorders</b>				
Hypotension	16.4	< 10	< 10	< 10
<b>Eye disorders</b>				
Vision blurred	16.0	< 10	< 10	< 10
<b>Injury, poisoning and procedural complications</b>				
Skin toxicity	0	0	19.9	0

\*If a treatment emergent adverse event (TEAE) was observed in  $\geq 10\%$  in any of the studies, SWOG-S0777, PETHEMA GEM2012 or IFM 2009 the TEAE is included in the table.

\*\* The frequencies for the TEAEs were based on descending order of frequency according to SOC per the Revlimid + bortezomib + dex arm in SWOG-S0777 study.  
dex - dexamethasone

#### 4.8.1.1.2 Newly Diagnosed Multiple Myeloma Transplant ineligible – Revlimid in combination with dexamethasone

In the large phase III, controlled study (MM-020), data were evaluated from 1072 patients who received at least one dose of Revlimid with low-dose dexamethasone, either given Continuously (Rd) or for 18 cycles (Rd18). Median treatment duration was notably longer in the Continuous Rd arm (80.1 weeks) when compared to the Rd18 arm (72 weeks) and the MPT arm (67.1 weeks), as the Continuous Rd arm sustained treatment until disease progression, while treatments in arms Rd18 and MPT were both capped at 72 weeks. The median average daily dose of Revlimid was 21.8 mg in the Continuous Rd arm and 24.4 mg in the Rd18 arm.

In general, the most frequently reported adverse events (AEs) were comparable in Arm Rd until progression and Arm Rd18, and included diarrhoea, anaemia, constipation, peripheral oedema, neutropenia, fatigue, back pain, nausea, asthenia, insomnia, decreased appetite and muscle spasms. The most frequently reported Grade 3 or 4 events included neutropenia, anaemia, thrombocytopenia, pneumonia, asthenia, fatigue, back pain, hypokalaemia, rash, cataract, lymphopenia, dyspnoea, DVT, hyperglycaemia, and leukopenia. No particular AE led to discontinuation of any study drug in more than 2% of subjects in either arm. Over time, the Rd regimen was generally better tolerated than MPT. Subjects in Arm MPT discontinued treatment sooner and more frequently prior to disease progression than subjects receiving Rd. Subjects in Arm MPT also more frequently experienced AEs leading to study drug discontinuation. Extended treatment in the Rd arm beyond 18 months generally resulted in a limited increase in most AEs compared with Rd18 or MPT.

For the Rd regimen, 66.4% of patients experienced at least one AE leading to Revlimid interruption, 60.0% experienced at least one AE leading to dexamethasone interruption, and 69.2% experienced at least one AE leading to Revlimid or dexamethasone interruption, compared to 77.4% in the MPT arm for thalidomide or melphalan or prednisone interruption.

A list of the treatment-emergent adverse events (TEAEs) that occurred at a frequency of greater than or equal to 10% in any arm for Study MM-020 is provided in Table 5 (see Section 4.8.1.1.3).

#### 4.8.1.1.3 Newly Diagnosed Multiple Myeloma Post Transplant Maintenance – Revlimid monotherapy

The safety of lenalidomide was assessed in two Phase 3 multicenter, randomised, double-blind, 2- arm, parallel group, placebo-controlled studies: CALGB 100104 and IFM 2005-02. The AEs from Study CALGB 100104 included events reported post-high dose melphalan/ASCT as well as events from the maintenance treatment period. In Study IFM 2005-02, the AEs were from the maintenance treatment period only.

In Study CALGB 100104, the overall frequencies of TEAEs, Grade 3 or 4 TEAEs, serious TEAEs (SAEs), and TEAEs leading to discontinuation of study drug were higher in the subjects administered Revlimid (96.0%, 79.5%, 28.1%, and 28.1%, respectively) compared to subjects administered placebo (85.1%, 55.2%, 12.2%, and 2.7%, respectively). Of note, the treatment duration in the CALGB Revlimid arm was longer than in the CALGB placebo arm (mean maintenance treatment duration: 30.3 months versus 13.2 months, respectively; total person-years of maintenance therapy: 565 versus 243, respectively), resulting in a longer AE observation period in the Revlimid arm compared with the placebo arm.

In Study IFM 2005-02, the frequency of overall TEAEs in subjects administered Revlimid (99.3%) was similar compared to placebo subjects (97.1%). For Grade 3 or 4 TEAEs, SAEs, and TEAEs leading to discontinuation of study drug, the overall frequencies of AEs were higher in the Revlimid arm (75.1%, 44.7%, and 27.6%, respectively) compared with the placebo arm (32.1%, 22.9%, and 10.0%, respectively).

A list of the TEAEs that occurred at a frequency of greater than or equal to 10% in any arm for Studies CALGB 100104 (post-transplant and maintenance period) and IFM 2005-02 (maintenance period only) is provided in Table 4 below.

**Table 4. Most frequently reported Treatment-Emergent Adverse Events (≥ 10% in Revlimid Arm) in Studies CALGB 100104 (post-transplant and maintenance period) and/or IFM 2005-02 (maintenance period only)**

System organ class Preferred term	% frequency			
	CALGB 100104		IFM 2005-02	
	Len	Pbo	Len	Pbo
Number of patients (N)	224	221	293	280
<b>Infections and Infestations</b>				
Bronchitis	< 10	< 10	47.4	37.1
Nasopharyngitis	< 10	< 10	34.8	30.0
Upper respiratory tract infection	26.8	15.8	10.9	< 10
Gastroenteritis	< 10	< 10	22.5	19.6
Neutropenic infection	17.9	< 10	0.0	0.0
Rhinitis	< 10	< 10	15.0	< 10
Sinusitis	< 10	< 10	14.0	< 10
Influenza	< 10	< 10	13.3	< 10
<b>Blood and Lymphatic System Disorders</b>				
Neutropenia	79.0	42.5	60.8	11.8
Thrombocytopenia	72.3	45.7	23.5	10.4
Leukopenia	22.8	11.3	31.7	< 10
Anaemia	21.0	12.2	< 10	< 10
Lymphopenia	17.9	13.1	< 10	< 10
Febrile neutropenia	17.4	15.4	< 10	< 10
<b>Nervous system disorders</b>				
Paraesthesia	< 10	< 10	13.3	10.7

System organ class Preferred term	% frequency			
	CALGB 100104		IFM 2005-02	
	Len	Pbo	Len	Pbo
<b>Number of patients (N)</b>	<b>224</b>	<b>221</b>	<b>293</b>	<b>280</b>
Peripheral sensory neuropathy	12.1	11.8	-	-
<b>Respiratory, thoracic and mediastinal disorders</b>				
Cough	10.3	< 10	27.3	20.0
Lung disorder	< 10	< 10	11.6	< 10
<b>Gastrointestinal Disorders</b>				
Diarrhoea	54.5	37.6	38.9	12.1
Nausea	14.7	10.0	10.6	10.0
Constipation	< 10	< 10	12.6	< 10
Gastrointestinal disorder	< 10	< 10	12.3	< 10
Abdominal pain	< 10	< 10	10.6	< 10
<b>Hepatobiliary Disorders</b>				
Hyperbilirubinaemia	15.2	< 10	< 10	< 10
<b>Skin and Subcutaneous Tissue Disorders</b>				
Rash	31.7	21.7	< 10	< 10
Dry skin	< 10	< 10	10.6	7.5
<b>Metabolism and Nutrition Disorders</b>				
Hypokalaemia	10.7	< 10	< 10	< 10
<b>Musculoskeletal and connective tissue disorders</b>				
Muscle spasms	0.0	< 10 *	33.4	15.4
Back pain	< 10	11.3*	25.9	28.2*
Arthralgia	< 10	< 10 *	14.0	16.8*
<b>General Disorders and Administration Site Conditions</b>				
Asthenia	0.0	< 10 *	29.7	18.9
Fatigue	22.8	13.6	10.6	< 10
Pyrexia	< 10	< 10	20.5	< 10
Pain	< 10	< 10 *	10.6	11.8*

Len = lenalidomide; Pbo = placebo

\* Events where frequency in the placebo arm was the same or higher than the Revlimid arm(s) in the same study

- Term not reported.

The following SAEs were also noted in both studies - lung infection, infection, urinary tract infection, herpes zoster and myelodysplastic syndrome.

#### 4.8.1.1.4 Previously Treated Multiple Myeloma- Revlimid in Combination with dexamethasone

In two Phase III placebo-controlled studies (MM-009 and MM-010), 353 patients with previously treated MM were exposed to the Rev/dex combination and 351 to the placebo/dex combination. The median duration of exposure to study treatment was significantly longer (44.0 weeks) in the Rev/dex group as compared to placebo/dex (23.1 weeks). The difference was accounted for by a lower rate of discontinuation from study treatment due to lower progression of disease in patients exposed to Rev/dex (39.7%) than in placebo/dex patients (70.4%).

The most serious AEs were: Venous thromboembolism (DVT and PE) and Grade 4 neutropenia [see Section 4.4. (Special Warnings and Precautions for Use)].

Table 5 collectively shows the TEAEs that occurred at a frequency of  $\geq 10\%$  in any of the Rev/dex study arms for studies in subjects with previously treated MM (Studies MM-009 and MM-010) and the study in NDMM subjects ineligible for ASCT (Study MM-020).

**Table 5. Treatment-Emergent Adverse Events Reported for at least 10% of Subjects in Any Revlimid Arm – Previously treated MM Studies (MM-009/010), and ASCT Ineligible NDMM Study (MM-020)**

System Organ Class Preferred term	% frequency				
	MM-009/010		MM-020		
	RD	Pbo	Continuous <sup>a</sup> Rd	Rd18 <sup>b</sup>	MPT
<b>Number of patients (N)</b>	<b>353</b>	<b>350</b>	<b>532</b>	<b>540</b>	<b>541</b>
<b>Blood and Lymphatic System Disorders</b>					
Anaemia	36.0	25.1	43.8	35.7	42.3
Neutropenia	44.8	< 10	35.0	33.0	60.6*
Thrombocytopenia	22.9	12.0	19.5	18.5	25.0*
Leukopenia	< 10	< 10	11.8	11.1	17.4*
Lymphopenia	< 10	< 10	11.1	< 10	13.1*
<b>Eye disorders</b>					
Cataract	< 10	< 10	13.7	< 10	< 10
Vision blurred	18.4	12.3	< 10	< 10	< 10
<b>Gastrointestinal Disorders</b>					
Diarrhoea	45.3	29.7	45.5	38.5	16.5
Constipation	41.9	21.7	43.0	39.3	52.7*
Nausea	27.8	21.7	28.6	23.7	30.5*
Vomiting	13.3	< 10	17.5	12.6	20.1*
Abdominal pain	11.0	< 10	13.0	< 10	< 10
Dyspepsia	17.0	14.6	10.7	< 10	< 10
<b>General Disorders and Administration Site Conditions</b>					
Oedema peripheral	32.3	24.9	39.7	31.3	39.7*
Fatigue	47.0	42.0	32.5	32.8	28.5
Asthenia	30.6	26.9	28.2	22.8	22.9
Pyrexia	29.5	24.0	21.4	18.9	14.0
Oedema	10.8	< 10	< 10	< 10	< 10
<b>Infections and Infestations</b>					
Bronchitis	16.1	< 10	16.9	10.9	< 10
Nasopharyngitis	22.1	< 10	15.0	10.0	< 10
Urinary tract infection	< 10	< 10	14.3	11.7	< 10
Upper respiratory tract infection	26.1	15.7	13.0	< 10	< 10
Pneumonia	16.7	< 10	12.4	12.6	< 10
Pharyngitis	16.7	< 10	< 10	< 10	< 10
<b>Investigations</b>					
Weight decreased	19.8	15.4	13.5	14.4	8.9
<b>Metabolism and Nutrition Disorders</b>					
Decreased appetite	22.7	14.0	23.1	21.3	13.3
Hypokalaemia	15.9	< 10	17.1	11.5	< 10
Hyperglycaemia	16.7	14.3	11.7	< 10	< 10
Hypocalcaemia	< 10	< 10	10.7	10.4	< 10
<b>Musculoskeletal and Connective Tissue Disorders</b>					
Back pain	28.6	19.4	32.0	26.9	21.4
Muscle spasms	38.2	23.1	20.5	18.9	11.3
Arthralgia	20.7	18.3	19.0	13.1	12.2
Bone pain	17.0	11.7	16.4	14.3	11.5
Pain in extremity	15.9	11.1	14.8	12.2	11.3

System Organ Class Preferred term	% frequency				
	MM-009/010		MM-020		
	RD	Pbo	Continuous <sup>a</sup> Rd	Rd18 <sup>b</sup>	MPT
<b>Number of patients (N)</b>	<b>353</b>	<b>350</b>	<b>532</b>	<b>540</b>	<b>541</b>
Musculoskeletal pain	< 10	< 10	12.6	10.9	< 10
Musculoskeletal chest pain	< 10	< 10	11.3	< 10	< 10
Muscular weakness	16.7	16.3	< 10	< 10	< 10
Myalgia	11.3	11.1	< 10	< 10	< 10
<b>Nervous System Disorders</b>					
Peripheral sensory neuropathy	< 10	< 10	20.5	17.0	35.3*
Paraesthesia	15.0	13.4	16.0	13.7	19.0*
Dizziness	24.9	16.9	15.8	13.0	21.1*
Headache	27.2	25.4	14.1	< 10	10.4
Tremor	21.2	< 10	14.1	13.5	18.5*
Hypoaesthesia	11.6	< 10	< 10	< 10	< 10
Dysgeusia	15.3	10.0	< 10	< 10	< 10
Neuropathy peripheral	15.3	10.9	< 10	< 10	11.5*
<b>Psychiatric Disorders</b>					
Insomnia	38.0	37.7	27.6	23.5	< 10
Depression	13.6	10.9	10.9	< 10	< 10
Anxiety	12.5	< 10	< 10	< 10	< 10
Confusional state	10.8	< 10	< 10	< 10	< 10
<b>Respiratory, Thoracic and Mediastinal Disorders</b>					
Cough	26.9	25.4	22.7	17.4	12.6
Dyspnoea	25.8	18.0	22.0	16.5	20.9
<b>Skin and Subcutaneous Tissue Disorders</b>					
Rash	23.8	11.1	21.4	24.3	17.2
Hyperhidrosis	10.2	< 10	< 10	< 10	< 10
<b>Vascular Disorders</b>					
Deep vein thrombosis	< 10	< 10	10.2	< 10	< 10

MPT = melphalan, prednisone and thalidomide; Pbo = placebo; RD = Revlimid + high-dose dexamethasone; Rd = Revlimid + low-dose dexamethasone.

a = Continuous Rd arm where patients were dosed with Revlimid + low-dose dexamethasone until progressive disease

b = Rd18 arm where patients were dosed with Revlimid + low-dose dexamethasone for up to eighteen 28-day cycles (72 weeks)

\* Events where frequency in the comparator MPT arm was the same or higher than the Revlimid treatment arm(s) in Study MM-020.

#### 4.8.1.2 Myelodysplastic Syndromes – Revlimid monotherapy

Data from the placebo-controlled MDS-004 study demonstrate that Revlimid is also well tolerated in subjects with low- or intermediate-1-risk MDS with a deletion 5q cytogenetic abnormality with or without other cytogenetic abnormalities. The most frequently reported AEs were related to blood and lymphatic system disorders, skin and subcutaneous tissue disorders, gastrointestinal disorders, and general disorders and administrative site conditions.

In study MDS-004, neutropenia in 76.8% (106/138) of subjects and thrombocytopenia in 46.4% (64/138) of subjects were the most frequently reported AEs. The next most common AEs observed were diarrhoea (34.8%), constipation (19.6%) and nausea (19.6%); pruritus (25.4%) and rash (18.1%); fatigue (18.1%) and oedema peripheral (15.2%); and muscle spasms (16.7%). Table 6 summarises the AEs that were reported in  $\geq 10\%$  of the Revlimid-treated patients in Study MDS-004.

**Table 6: Most Frequently Reported ( $\geq 10\%$  in Revlimid arm) Adverse Events in Study MDS-004**

System Organ Class Preferred term	% with Revlimid <sup>a</sup> (N=138)	% with Placebo (N=67)
<b>General Disorders &amp; Administration Site Conditions</b>		
Fatigue	18.1	7.5
Oedema Peripheral	15.2	7.5
Pyrexia	13.8	6.0
<b>Gastrointestinal Disorders</b>		
Diarrhoea	34.8	17.9
Nausea	19.6	9.0
Constipation	19.6	7.5
Abdominal pain	10.9	6.0
<b>Musculoskeletal and Connective Tissue Disorders</b>		
Muscle spasms	16.7	9.0
<b>Nervous System disorders</b>		
Headache	14.5	9.0
<b>Respiratory, Thoracic and Mediastinal Disorders</b>		
Cough	11.6	6.0
<b>Infections and Infestations</b>		
Nasopharyngitis	11.6	7.5
Bronchitis	11.6	4.5
Upper respiratory tract infection	10.9	6.0
<b>Skin and Subcutaneous Tissue Disorders</b>		
Pruritus	25.4	4.5
Rash	18.1	1.5
Dry Skin	10.1	1.5
<b>Blood and Lymphatic System Disorders</b>		
Neutropenia	76.8	17.9
Thrombocytopenia	46.4	3.0
Leukopenia	12.3	4.5

a: Combined 5 mg and 10 mg Revlimid treatment arms from Study MDS-004.

The safety results (N=148) from the Phase 2 open-label study MDS-003 are consistent with the findings from MDS-004. Neutropenia (66.2%) and thrombocytopenia (64.9%) were the most frequently reported AEs, followed by diarrhoea (60.1%), pruritus (44.6%), fatigue (42.6%), rash (37.8%) and arthralgia (31.8%).

The most serious Grade 3 and Grade 4 AEs from the MDS-004 study (N=138, 5 mg and 10 mg doses combined) were neutropenia (5.8%), thrombocytopenia (5.8%), venous thromboembolism [DVT (3.6%)] and PE (2.9%), and altered mood (0.7%). The frequency of these events in the open-label MDS-003 study (N=148) were neutropenia (64.9%), thrombocytopenia (54.7%) and venous thromboembolism [DVT (4.7%) and PE (3.4%)].

In the 10 mg group from study MDS-004, the dose of Revlimid was reduced or interrupted at least once due to an AE in 44 (62.3%) patients, which occurred a mean of 50.1 days into the study and lasted a mean of 26.8 days. Twenty-four (34.8%) subjects had a second dose reduction or interruption. In study MDS-003, the dose of Revlimid was reduced or interrupted at least once due to an AE in 127 (85.8%) patients, which occurred a mean of 75.2 days into the study and lasted a mean of 30.4 days. Eighty-two (55.4%) subjects had a second dose reduction or interruption. The mean interval between the first and second dose reduction/interruption was 198.2 days. The second dose reduction/interruption due to an AE lasted a mean of 44.5 days.

#### 4.8.1.3 Previously Treated Mantle Cell Lymphoma - Revlimid monotherapy

The overall safety profile of Revlimid in patients with previously treated MCL is based on data from 254 patients from a Phase II, randomised, controlled study (MCL-002) and 134 patients from a Phase II, single arm study (MCL-001).

Table 7 summarises the most common AEs i.e. that were reported in  $\geq 10\%$  of the Revlimid-treated subjects in Studies MCL-001 and MCL-002.

**Table 7: Most Frequently Reported ( $\geq 10\%$  in Revlimid arm) Adverse Events - Studies MCL-002 and MCL-001**

System Organ Class Preferred term	MCL-002		MCL-001
	% with Revlimid (N=134)	% with Investigator's Choice (N=83)	% with Revlimid (N=134)
<b>General Disorders &amp; Administration Site Conditions</b>			
Fatigue	21.0	< 10	33.6
Pyrexia	16.8	12.0	25.4
Asthenia	15.6	13.3	14.9
Oedema peripheral	10.2	10.8	16.4
<b>Gastrointestinal Disorders</b>			
Diarrhoea	22.8	< 10	34.3
Constipation	17.4	< 10	15.7
Nausea	10.8	14.5	31.3
Vomiting	< 10	10.8	12.7
Abdominal pain	< 10	< 10	10.4
<b>Respiratory, Thoracic and Mediastinal Disorders</b>			
Cough	11.4	< 10	30.6
Dyspnoea	< 10	< 10	20.1
Oropharyngeal pain	< 10	< 10	10.4
<b>Infections and Infestations</b>			
Nasopharyngitis	15.0	< 10	< 10
Upper respiratory tract infection	12.0	< 10	13.4
Pneumonia	< 10	< 10	10.4
<b>Skin and Subcutaneous Tissue Disorders</b>			
Rash	10.8	< 10	22.4
Pruritus	< 10	< 10	17.2
<b>Blood and Lymphatic System Disorders</b>			
Neutropenia	50.9	34.9	49.3
Thrombocytopenia	36.5	39.8	36.6
Anaemia	28.7	22.9	31.3
Leukopenia	16.8	21.7	14.9
<b>Metabolism and Nutrition Disorders</b>			
Decreased appetite	11.4	< 10	15.7
Hypokalaemia	< 10	< 10	13.4
<b>Musculoskeletal and connective tissue disorders</b>			
Back pain	< 10	< 10	14.9
Muscle spasms	< 10	< 10	12.7
<b>Investigations</b>			
Weight decreased	< 10	< 10	14.2

#### 4.8.2 Tabulated List of Adverse Reactions [Multiple Myeloma (MM), Myelodysplastic Syndromes (MDS), and Mantle Cell Lymphoma (MCL)]

The ADRs observed in MM patients treated with Revlimid in combination with bortezomib and dexamethasone, Revlimid in combination with dexamethasone or Revlimid monotherapy post-ASCT, MDS patients treated with at least one dose of 10 mg Revlimid, and in MCL patients are tabulated below by system organ class and frequency (Table 8). Frequencies are defined as: very common ( $\geq 1/10$ ); common ( $\geq 1/100, < 1/10$ ); and uncommon ( $\geq 1/1,000, < 1/100$ ).

The following table is derived from data gathered during the main clinical trials in MM, MDS and MCL. The data were not adjusted according to differences in duration of treatment across the MM studies.

ADRs have been included under the appropriate category in the table below according to the highest frequency observed in the Revlimid arm of any of the main clinical trials.

**Table 8: Adverse Drug Reactions (including Grade 3 and 4 ADRs) observed in Patients in Main MM, MDS and MCL Studies\***

Frequency	All ADRs	Grade 3 and 4 ADRs
<b>Infections and Infestations</b>		
Very common	Nasopharyngitis; Pharyngitis; Pneumonias; Bronchitis; Bacterial, viral and fungal infections (including opportunistic infections); Upper respiratory tract infection; Sinusitis; Rhinitis	Neutropenic infection Pneumonia
Common	Sepsis Lung infection; Urinary tract infection	Bronchitis; Upper respiratory tract infection; Sepsis; Bacterial, viral and fungal infections (including opportunistic infections); Urinary tract infection; Enterocolitis infectious
<b>Neoplasms Benign, Malignant and Unspecified (Including Cysts and Polyps)</b>		
Common	Tumour flare	Tumour flare; Squamous cell carcinoma of skin; Basal cell carcinoma
<b>Blood and Lymphatic System Disorders</b>		
Very common	Neutropenias; Thrombocytopenia; Anaemia; Leukopenias; Febrile neutropenia; Lymphopenia	Neutropenias; Thrombocytopenia; Anaemia; Leukopenias; Febrile neutropenia; Lymphopenia
Common	Pancytopenia	Pancytopenia
<b>Immune System Disorders</b>		
Uncommon	Hypersensitivity	
<b>Endocrine Disorders</b>		
Common	Hypothyroidism	
<b>Metabolism and Nutrition Disorders</b>		
Very common	Decreased appetite; Hyperglycaemia; Hypokalaemia; Hypoglycaemia; Hypocalcaemia; Hyponatraemia; Dehydration	Hypokalaemia
Common	Hypomagnesaemia; Iron overload	Hypocalcaemia; Hypophosphataemia; Diabetes mellitus; Hyperglycaemia; Dehydration; Hyponatraemia; Gout; Decreased appetite
<b>Psychiatric Disorders</b>		
Very common	Insomnia; Depression	
Common		Depression; Insomnia

Frequency	All ADRs	Grade 3 and 4 ADRs
<b>Nervous System Disorders</b>		
Very common	Peripheral neuropathies; Paraesthesia; Dizziness; Tremor; Dysgeusia; Headache	Peripheral neuropathy
Common	Syncope; Lethargy; Neuralgia; Dysaesthesia	Syncope; Dizziness; Neuralgia; Headache
<b>Eye Disorders</b>		
Very common	Cataracts; Blurred vision	
Common		Cataracts
<b>Ear and Labyrinth Disorders</b>		
Common	Vertigo	
<b>Cardiac Disorders</b>		
Common	Atrial fibrillation	Atrial fibrillation; Myocardial infarction (including acute); Cardiac failure (including congestive); Tachycardia
<b>Vascular Disorders</b>		
Very common	Venous thromboembolic events (predominantly deep vein thrombosis and pulmonary embolism); Hypotension	Venous thromboembolic events (predominantly deep vein thrombosis and pulmonary embolism)
Common	Hypertension; Haematoma	Hypotension; Hypertension
<b>Respiratory, Thoracic and Mediastinal Disorders</b>		
Very common	Dyspnoea; Cough	
Common	Epistaxis; Dysphonia	Respiratory distress; Pleuritic pain; Hypoxia
<b>Gastrointestinal Disorders</b>		
Very common	Diarrhoea; Constipation; Nausea; Abdominal pain; Dyspepsia; Vomiting Stomatitis, Dry mouth	
Common	Abdominal pain upper	Diarrhoea; Nausea; Abdominal pain; Constipation; Toothache; Vomiting; Gastrointestinal haemorrhage; Small intestinal obstruction,
<b>Hepatobiliary Disorders</b>		
Very common	Alanine aminotransferase increased; Aspartate aminotransferase increased; Abnormal liver function tests	
Common	Hepatocellular injury; Hyperbilirubinaemia	Cholestasis; Hepatotoxicity; Hepatocellular injury; Alanine aminotransferase increased; Abnormal liver function tests
<b>Skin and Subcutaneous Tissue Disorders</b>		
Very common	Pruritus; Rash (including dermatitis allergic); Dry skin	
Common	Erythema; Hyperhidrosis	Rash; Pruritus
Uncommon	Drug rash with eosinophilia and systemic symptoms (DRESS)	DRESS
<b>Musculoskeletal and Connective Tissue Disorders</b>		
Very common	Musculoskeletal and connective tissue pain and discomfort; Muscle spasms; Arthralgia; Bone pain; Myalgia; Muscular weakness; Pain in extremity; Back pain	
Common		Musculoskeletal and connective tissue pain and discomfort; Muscular weakness; Bone pain; Arthralgia; Back pain; Bone pain
<b>Renal and Urinary Disorders</b>		
Very common	Renal failure (including acute)	
Common		Renal failure

Frequency	All ADRs	Grade 3 and 4 ADRs
<b>General Disorders and Administration Site Conditions</b>		
Very common	Pyrexia; Influenza-like illness syndrome (including pyrexia, cough, rhinitis, myalgia, musculoskeletal pain, headache and chills); Fatigue; Asthenia; Oedema (including peripheral)	Fatigue
Common	Chest pain	Pyrexia; Asthenia Oedema (including peripheral)
<b>Investigations</b>		
Very common	Weight decreased; Blood alkaline phosphatase increased	
Common	C-reactive protein increased	Weight decreased
<b>Injury, Poisoning and Procedural Complications</b>		
Common	Fall; Contusion	Fall

\* The ADRs have been identified based on pre-specified numerical algorithms applied to frequencies of Treatment Emergent Adverse Events observed in each study.

### 4.8.3 Post-Marketing Experience

The following AEs have been identified during post-marketing use of Revlimid. Because these reactions are reported voluntarily, it is not always possible to reliably estimate their frequency or establish a causal relationship to drug exposure:

**Skin and Subcutaneous tissue Disorders<sup>1</sup>:** Stevens-Johnson Syndrome, Toxic Epidermal Necrolysis and DRESS

**Neoplasms Benign, Malignant and Unspecified (including cysts and polyps):** Tumour Lysis Syndrome, Tumour Flare Reaction

**Respiratory, Thoracic and Mediastinal Disorders:** Pneumonitis

**Cardiac Disorders:** Myocardial Infarction

**Endocrine disorders:** Hyperthyroidism, Hypothyroidism

**Hepatobiliary Disorders:** Transient abnormal liver laboratory tests, Hepatic failure, Acute hepatic failure, Hepatitis toxic, Cytolytic hepatitis, Cholestatic hepatitis, Mixed cytolytic/cholestatic hepatitis

**Infections and infestations:** Viral reactivation (such as hepatitis B virus or herpes zoster), Progressive multifocal leukoencephalopathy (see also Section 4.4 Special Warnings and Precautions for Use)

**Immune System Disorders<sup>1</sup>:** Allergic conditions (angioedema, anaphylaxis, urticaria), Acute graft-versus-host disease (following allogenic hematopoietic transplant), Solid organ transplant rejection

**Musculoskeletal and connective tissue disorders:** Cases of rhabdomyolysis have been observed, some of them when Revlimid is administered with a statin.

<sup>1</sup> All PTs under MedDRA SMQ of Severe Cutaneous ADRs and HLT rash, and All PTs under HLG T Angioedema and Urticaria will be considered listed

### 4.8.4 Hepatic Disorders

Cases of transient liver laboratory abnormalities (predominantly transaminases) were reported in patients treated with Revlimid. For such patients, treatment with Revlimid should be interrupted and restarted once the levels return to baseline. Successful re-challenge with lenalidomide, without recurrence of elevated liver laboratory results, was reported in some patients.

#### **4.8.5 Thyroid Function**

Cases of hypothyroidism and hyperthyroidism have been reported. Optimal control of co-morbid conditions is recommended before start of treatment. Baseline and ongoing monitoring of thyroid function is recommended.

#### **4.8.6 Rhabdomyolysis**

Cases of rhabdomyolysis have been reported. Some cases have been when Revlimid is administered with a statin. This risk may be simply additive.

#### **4.8.7 Reporting of Suspected Adverse Reactions**

Reporting suspected adverse reactions after registration 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 at <http://www.tga.gov.au/reporting-problems>.

### **4.9 OVERDOSE**

There is no specific experience in the management of Revlimid overdose in patients with MM, MDS, or MCL. In dose-ranging studies, healthy subjects were exposed to up to 200 mg (administered 100 mg twice daily) and in single-dose studies, some subjects were exposed to up to 400 mg. Pruritus, urticaria, rash, and elevated liver transaminases were the primary reported adverse events. No clinically significant changes in ECGs, blood pressure, or pulse rate were observed.

While no haematologic events were associated with an overdose, such events may be expected since in clinical trials, the dose-limiting toxicity was essentially haematological. In the event of overdose, supportive care is advised. In Australia, contact the Poisons Advisory Centre on 13 11 26 for advice on management.

## **5 PHARMACOLOGICAL PROPERTIES**

### **5.1 Pharmacodynamic Properties**

Pharmacotherapeutic group: Immunomodulating agent

#### **5.1.1 Mechanism of Action**

Lenalidomide has a pleiotropic mechanism of action including immunomodulatory, anti-neoplastic, anti-angiogenic, and pro-erythropoietic properties. Specifically, lenalidomide inhibits proliferation of certain haematopoietic tumour cells (including multiple myeloma [MM] plasma tumour cells and those with deletions of chromosome 5), enhances T cell- and Natural Killer (NK) cell-mediated immunity and increases the number of NK T cells, inhibits production of pro-inflammatory cytokines (e.g. TNF- $\alpha$  and IL-6) by monocytes, inhibits angiogenesis by blocking the migration and adhesion of endothelial cells and the formation of microvessels, and augments foetal haemoglobin production by CD34+ haematopoietic stem cells.

#### **5.1.2 Cardiac Electrophysiology**

A QTc study was conducted to evaluate the effects of lenalidomide on QT interval at single doses of 10 mg and 50 mg. A single dose of Revlimid up to 50 mg is not associated with prolongation of the QT interval in healthy male subjects. This indicates that lenalidomide is not expected to result in clinically significant prolongation of the QT interval in patients at the approved therapeutic doses.

### 5.1.3 Clinical Trials

#### 5.1.3.1 Transplant ineligible Newly Diagnosed Multiple Myeloma – Revlimid in combination with bortezomib and dexamethasone – Study SWOG-S0777

The SWOG S0777 study is a Phase 3, randomized, active-controlled, open-label, multicentre 2-arm clinical study of 523 patients to compare the efficacy and safety of Revlimid, bortezomib, and dexamethasone (Rbd) to that of Revlimid and dexamethasone (Rd) in newly diagnosed multiple myeloma patients who were not intended for immediate stem cell transplant. Patients in the Rbd arm were treated with Revlimid at 25 mg/day orally on Days 1-14, intravenous bortezomib 1.3 mg/m<sup>2</sup> on Days 1, 4, 8, and 11, and dexamethasone 20 mg/day orally on Days 1,2,4,5,8,9,11 and 12, up to eight 21-day repeated cycles. Patients in the Rd arm were treated with Revlimid at 25 mg/day orally on Days 1-21, and dexamethasone 40 mg/day orally on Days 1, 8, 15, and 22, up to six 28-day repeated cycles. After initial treatment (24 weeks for each treatment arm), Rd was continued until disease progression for all patients in repeated 28-day cycles with Revlimid 25 mg orally on Days 1-21 and dexamethasone 40 mg on Days 1, 8, 15, and 22. Treatment was to be continued until disease progression.

Table 9 provides a summary of the subject disposition of the 'Intent To Treat' population.

**Table 9: Subject disposition ITT population (SWOG-S0777)**

Parameter	Rbd n (%)	Rd n (%)	Total n (%)
Randomised (ITT population)	<b>N = 263</b>	<b>N = 260</b>	<b>N = 523</b>
Received initial treatment but not continued Rd (ie, discontinued from study treatment during initial treatment)	110 (41.8)	91 (35.0)	201 (38.4)
<b>Reason subject discontinued initial treatment</b>	<b>N = 110</b>	<b>N = 91</b>	<b>N = 201</b>
Treatment completed per protocol criteria	1 (0.9)	0 (0.0)	1 (0.5)
Adverse event/side effects/complications	60 (54.5)	24 (26.4)	84 (41.8)
Patient withdrawal/refusal after beginning protocol therapy	5 (4.5)	10 (11.0)	15 (7.5)
Patient withdrawal/refusal prior to beginning protocol therapy	1 (0.9)	0 (0.0)	1 (0.5)
Disease progression, relapse during active treatment	10 (9.1)	25 (27.5)	35 (17.4)
Death on study	7 (6.4)	4 (4.4)	11 (5.5)
Other	26 (23.6)	28 (30.8)	54 (26.9)
<b>Reason subjects discontinued continued Rd</b>	<b>N = 119</b>	<b>N = 145</b>	<b>N = 264</b>
Adverse event/side effects/complications	37 (24.3)	40 (24.2)	77 (24.3)
Patient withdrawal/refusal after beginning protocol therapy	9 (5.9)	11 (6.7)	20 (6.3)
Disease progression, relapse during active treatment	53 (34.9)	72 (43.6)	125 (39.4)
Death on study	4 (2.6)	3 (1.8)	7 (2.2)
Other	16 (10.5)	19 (11.5)	35 (11.0)

ITT = intent to treat; Rd = lenalidomide and dexamethasone; Rbd = lenalidomide, bortezomib, and dexamethasone.

The primary efficacy endpoint in the study was progression free survival (PFS). The demographics and disease-related baseline characteristics of the patients were similar across the two treatment groups and reflected a broad NDMM patient population. In total 523 patients were enrolled into the study, with 263

patients randomised to Rbd and 260 patients randomised to Rd, 162 (30.9%) subjects were stratified as "no intent to transplant at disease progression", 81 subjects in the Rbd arm and 81 subjects in the Rd arm.

The results of PFS, as assessed by The Independent Response Adjudication Committee (IRAC), at the time of the primary analysis, using a cut-off of 05 November 2015 (50.6 months follow up) showed a 24% reduction in risk of disease progression or death favoring Rbd (HR = 0.76; 95% CI 0.61, 0.94; p = 0.010). The median overall PFS was 42.5 months (95% CI 34.0, 54.8) in the Rbd arm versus 29.9 months (95% CI 25.6, 38.2) in the Rd arm. The benefit was observed regardless of eligibility for stem cell transplant.

The results for the study, using a cut-off of 01 December 2016, where the median follow-up time for surviving subjects was 69.0 months, are presented in Table below. The benefit favouring Rbd was observed regardless of eligibility for stem cell transplant.

**Table 10: Summary of Efficacy Data from Study SWOG-S0777**

	ITT Population		No Intent to Transplant at Progression	
	Revlimid + bortezomib + dex (N = 263)	Revlimid + dex (N = 260)	Revlimid + bortezomib + dex (N = 81)	Revlimid + bortezomib + dex (N = 81)
<b>IRAC-assessed PFS (months)</b>				
Median PFS Time (95% CI), months	41.7 (33.1, 51.5)	29.7 (24.2, 37.8)	37.5 (22.6, 50.3)	22.5 (15.6, 28.6)
HR (95% CI); p-value	0.76 (0.62, 0.94); 0.00996		<b>0.70</b> (0.49, 1.00)	
<b>Overall Survival (months)</b>				
Median OS Time (95% CI), months	89.1 (76.1, NE)	67.2 (58.4, 90.8)	75.5 (60.1, NE)	50.2 (35.9, 59.1)
HR (95% CI); p-value	0.75 (0.58, 0.97); 0.013		<b>0.57</b> (0.38, 0.86)	
<b>Response<sup>f</sup> – n (%)</b>				
≥ VGPR	153 (58.2)	83 (31.9)	52 (64.2)	30 (37.0)
ORR (CR, VGPR, or PR)	199 (75.7)	170 (65.4)	64 (79.0)	55 (67.9)

CI = confidence interval; CR = complete response; HR = hazard ratio; IRAC = Independent Response Adjudication Committee; ITT = intent to treat; NE = not estimable; ORR = overall response rate; PFS = progression-free survival; PR = partial response; VGPR = very good partial response.

Data cutoff date = 01 Dec 2016.

### 5.1.3.2 Transplant Eligible Newly Diagnosed Multiple Myeloma – Revlimid in combination with bortezomib and dexamethasone – Studies PETHEMA GEM2012 and IFM 2009

The efficacy and safety of Revlimid in combination with bortezomib and dexamethasone (Rbd) in this patient group was assessed in two Phase 3 multicentre studies: PETHEMA GEM2012 and IFM 2009.

The PETHEMA GEM2012 study was a Phase 3, randomized, controlled, open-label, multicentre study that compared 2 pre-transplant conditioning regimens (busulfan-melphalan and MEL200) in patients who had received Rbd (Revlimid, bortezomib and dexamethasone) as initial therapy. Patients received Revlimid 25 mg/day orally on Days 1-21, bortezomib 1.3 mg/m<sup>2</sup> on Days 1, 4, 8, and 11, and dexamethasone 40 mg/day orally on Days 1-4, 9-12 of repeated 28-day cycles. Following initial

treatment, patients received either a busulfan-melphalan or MEL200 conditioning regimen (1:1 randomization) and ASCT. Patients also received two additional 4-week cycles of Rbd following ASCT. In total 458 patients were enrolled into the study. This study is ongoing and the primary efficacy endpoint of PFS has not been reached yet. The primary efficacy results from the most recent analysis i.e. as of the 31 Mar 2017 data cutoff date, 102 (22.3%) PD or death events have occurred (both arms combined), which is approximately one third of the 294 total events needed for the final analysis of PFS. Rbd was given as six 4-week cycles (24 weeks).

The IFM 2009 study was a Phase 3, randomized, controlled, open-label, multicenter study that compared Rbd with and without ASCT as initial treatment for patients with previously untreated multiple myeloma who are eligible for transplant. Patients received Revlimid 25 mg/day orally on days 1-14, intravenous bortezomib 1.3 mg/m<sup>2</sup> on Days 1, 4, 8, and 11, and dexamethasone 20 mg/day orally on Days 1,2,4,5,8,9,11, and 12 of repeated 21-day cycles. Rbd was given as eight 3-week cycles (24 weeks) without immediate ASCT (Arm A) or three 3-week cycles (9 weeks) before ASCT (Arm B). Patients in Arm B also received and two additional 3-week cycles of Rbd following ASCT. In total 700 patients were enrolled into the study. Using the EMA censoring rules median PFS was 43.9 months (95%CI 41.1, NE) in the Rbd + auto-HSCT arm and 34.8 (95%CI 31.5, 37.7) in the Rbd arm. There was a statistically significant 33% reduction of risk of disease progression for subjects treated with Rbd + auto-HSCT compared with Rbd (HR = 0.67; 95% CI: 0.55, 0.82; p = 0.00010).

A summary of myeloma response rates for the treatment arms utilizing up to 24 weeks of Rbd initial treatment (i.e., six 28-day cycles or eight 21-day cycles) for the PETHEMA GEM2012 and IFM 2009 studies, using a cut-off of 31 March 2017 and the 01 December 2016 data respectively, are presented in the table below.

**Table 11: An Extract of Efficacy Data from Studies PETHEMA GEM2012 and IFM 2009**

	<b>PETHEMA GEM2012 Revlimid + bortezomib + dex<sup>a</sup> (4-week cycles × 6) (N = 458)</b>	<b>IFM 2009 Revlimid + bortezomib + dex<sup>a</sup> (3-week cycles × 8) (N = 350)</b>
<b>Myeloma response post initial treatment – n (%)</b>		
Overall response: CR, VGPR, or PR	382 (83.4)	333 (95.1)
≥ VGPR	305 (66.6)	237 (67.7)
CR	153 (33.4)	107 (30.6)
VGPR	152 (33.2)	130 (37.1)
PR	77 (16.8)	96 (27.4)
<b>Myeloma response post transplant – n (%)</b>		
Overall response: CR, VGPR, or PR	372 (81.2)	Not collected
≥ VGPR	344 (75.1)	
CR	202 (44.1)	
VGPR	142 (31.0)	
PR	28 (6.1)	
<b>MRD-negative rate (10<sup>-4</sup> sensitivity) Post-initial treatment – n (%)</b>		
Overall MRD-negative rate	217 (47.4)	Not collected
≥ VGPR and MRD negative	196 (42.8)	136 (38.9)
<b>MRD-negative rate (10<sup>-4</sup> sensitivity) Post-transplant - n (%)</b>		
Overall MRD-negative rate	287 (62.7)	Not collected
≥ VGPR and MRD negative	271 (59.2)	

MRD – Minimal Residual Disease: dex = dexamethasone

a Both Rbd arms combined. Data cutoff date = 31 Mar 2017 for the PETHEMA GEM2012 study and 01 Dec 2016 for the IFM 2009 study.

### 5.1.3.3 Newly Diagnosed Multiple Myeloma Ineligible for Transplant – Revlimid and dexamethasone

Study MM-020 was a Phase III, multicenter, randomised, open-label, 3-arm study to compare the efficacy and safety of Revlimid and low-dose dexamethasone (Rd) given for 2 different durations of time (i.e., [Arm A: Continuous Rd, until progressive disease] or [Arm B: Rd18, for up to eighteen 28-day cycles {72 weeks}]), to Arm C (melphalan, prednisone and thalidomide [MPT] for a maximum of twelve 42-day cycles [72 weeks]). A total of 1623 subjects with newly diagnosed multiple myeloma (NDMM) (ineligible for autologous stem cell transplantation [ASCT]) were enrolled and randomised in a 1:1:1 ratio to Arm A (n = 535), Arm B (n = 541), or Arm C (n = 547).

Patients in the Continuous Rd arm and the Rd18 arm received Revlimid 25 mg once daily on Days 1 to 21 of 28-day cycles. Dexamethasone 40 mg was dosed once daily on Days 1, 8, 15, and 22 of each 28-day cycle. Initial dose and regimen for the Continuous Rd and Rd18 arms were adjusted according to age and renal function. Patients > 75 years received a dexamethasone dose of 20 mg once daily on Days 1, 8, 15, and 22 of each 28-day cycle. All patients received prophylactic anticoagulation (low molecular weight heparin, warfarin, heparin, or low-dose aspirin) during the study.

The primary efficacy endpoint in the study was progression-free survival (PFS). The demographics and disease-related baseline characteristics of the patients were well balanced in all 3 arms. In general, study subjects had advanced-stage disease: of the total study population, 41% had ISS stage III, and 9% had severe renal insufficiency (creatinine clearance [CLCr] < 30 mL/min). The median age was 73 in the 3 arms, with 35% of total patients > 75 years of age.

The study showed a statistically significant prolongation of PFS benefit in patients receiving Continuous Rd (Arm A) compared to MPT (Arm C). The Hazard Ratio was 0.72 [95% CI: 0.61, 0.85]; p = 0.00006, indicating a 28% decrease in the risk of disease progression for patients treated with Continuous Rd compared with those treated with MPT. The median follow-up time for all surviving subjects at the interim analysis was 37.0 months. The overall response rate (≥ partial response [PR]) was higher in Continuous Rd (75.1%) than in MPT (62.3%) (p < 0.00001). A greater percentage of patients achieved at least a complete response (CR) in Continuous Rd than in MPT (15.1% versus 9.3%, respectively).

The preliminary analysis of the primary comparison of overall survival (OS) shows a reduction of risk of death of 22% in the Continuous Rd Arm compared with the MPT arm. In an updated analysis of OS where the median follow-up time for all surviving subjects was 45.5 months, a further improvement in the reduction of risk of death was noted in the Continuous Rd arm compared with the MPT arm (HR 0.75; p = 0.002). The efficacy results are summarised in Table 12 below.

PFS2 (an exploratory endpoint) was defined for all patients as the time from randomisation to second objective progressive disease (PD), or death from any cause, whichever occurred first. PFS2 was significantly longer in the Continuous Rd arm compared to arm MPT (HR 0.77 [95% CI: 0.65, 0.92]; p = 0.003). The results show a difference in patients who have started 2nd line treatment and type of therapy received: for Continuous Rd, of the 43% who started 2nd line treatment, 62% received bortezomib-containing therapy vs. 12% Revlimid therapy; for MPT, of the 57% who started 2nd line therapy, 49% received bortezomib-containing therapy vs. 34% Revlimid therapy.

**Table 12. Summary of Efficacy Data from Study MM-020**

Endpoint	Continuous Rd <sup>a</sup> (N = 535)	Rd18 <sup>b</sup> (N = 541)	MPT <sup>c</sup> (N = 547)
<b>PFS (months)</b>			
Median [95% CI]	25.5 [20.7, 29.4]	20.7 [19.4, 22.0]	21.2 [19.3, 23.2]
HR [95% CI]; p-value			
Rd vs. MPT	0.72 [0.61, 0.85]; p = 0.00006		
Rd vs. Rd18	0.70 [0.60, 0.82]; p = 0.00001		

Rd18 vs. MPT	1.03 [0.89, 1.20]; ns		
<b>Overall Survival (months)*</b>			
Median [95% CI]	58.9 [56.0, NE]	56.7 [50.1, NE]	48.5 [44.2, 52.0]
HR [95% CI]; p-value			
Rd vs. MPT	0.75 [0.62, 0.90]; p = 0.002		
Rd vs. Rd18	0.91 [0.75, 1.09]; ns		
Rd18 vs. MPT	0.83 [0.69, 0.99]; p = 0.034		
<b>Myeloma Response, n (%)</b>			
CR	81 (15.1)	77 (14.2)	51 (9.3)
VGPR	152 (28.4)	154 (28.5)	103 (18.8)
PR	169 (31.6)	166 (30.7)	187 (34.2)
ORR (CR, VGPR or PR)	402 (75.1)	397 (73.4)	341 (62.3)
<b>Duration of response (months)</b>			
Median [95% CI]	35.0 [27.9, 43.4]	22.1 [20.3, 24.0]	22.3 [20.2, 24.9]

CI = confidence interval; CR = complete response; HR = hazard ratio; MPT = melphalan, prednisone and thalidomide; NE = not estimable; ns = not significant; ORR = overall response rate; PFS = progression-free survival; PR = partial response; VGPR = very good partial response.

\* OS data is based on an updated analysis (03 March 2014).

a = Continuous Rd arm where patients were dosed with Revlimid + low-dose dexamethasone until progressive disease.

b = Rd18 arm where patients were dosed with Revlimid + low-dose dexamethasone for up to eighteen 28-day cycles (72 weeks)

c = MPT arm where patients were dosed with melphalan, prednisone and thalidomide for up to twelve 42-day cycles (72 weeks).

### 5.1.3.2 Newly Diagnosed Multiple Myeloma Post Transplant Maintenance - Revlimid

The efficacy and safety of Revlimid maintenance therapy in NDMM patients post-ASCT were assessed in two Phase III, multicenter, randomised, double-blind, 2-arm, parallel group, placebo-controlled studies: Studies CALGB 100104 and IFM 2005-02. The primary endpoint of both studies was PFS (defined from randomisation to the date of progression or death, whichever occurred first). Neither study was powered for the overall survival endpoint.

Study CALGB 100104 recruited patients aged 18-70 years with active NDMM requiring treatment and without prior progression after initial induction therapy. Induction therapy was required to have occurred within 12 months.

Within 90-100 days after high-dose chemotherapy supported by ASCT, patients were randomised 1:1 to receive either Revlimid or placebo maintenance therapy. The maintenance dose was 10 mg/day continuously (increased up to 15 mg/day after 3 months in the absence of dose-limiting toxicity), and treatment was continued until PD or patient withdrawal for another reason.

In total, 460 patients were randomised: 231 patients to Revlimid and 229 patients to placebo. The demographic and disease-related characteristics were balanced across both arms.

The study was unblinded (upon the recommendation of the data monitoring committee) after surpassing the threshold for a pre-planned interim analysis of PFS. After unblinding, patients in the placebo arm were allowed to cross over to receive Revlimid before disease progression.

The results of PFS at unblinding (following a pre-planned interim analysis) using a cut off of 17 December 2009 (15.5 months median follow-up), and an updated analysis of PFS and OS using a cut off of 1 February 2016 (81.6 months median follow-up), are presented in Table 13:

**Table 13. Summary of Efficacy Data from Study CALGB 100104**

Endpoint	Revlimid (N = 231)	Placebo (N = 229)
<b>Data at unblinding (17 December 2009)</b>		
<b>Investigator-assessed PFS (months)</b>		
Median [95% CI]	33.9 [NE, NE]	19.0 [16.2, 25.6]
HR [95% CI]; p-value	0.38 [0.27, 0.54]; p < 0.001	
<b>Data at updated analysis (1 February 2016)</b>		
<b>Investigator-assessed PFS (months)</b>		
Median [95% CI]	56.9 [41.9, 71.7]	29.4 [20.7, 35.5]
HR [95% CI]; p-value	0.61 [0.48, 0.76]; p < 0.001	
<b>Overall survival (months)</b>		
Median [95% CI]	111.0 [101.8, NE]	84.2 [80.0, 102.7]
HR [95% CI]; p-value	0.61 [0.46, 0.81]; p < 0.001	

CI = confidence interval; HR = hazard ratio; NE = not estimable; PFS = progression-free survival.

Study IFM 2005-02 recruited patients aged < 65 years at diagnosis who had undergone treatment with high-dose chemotherapy supported by ASCT and had achieved at least a stable disease response at the time of haematologic recovery.

Within 6 months after ASCT, patients were randomised 1:1 to receive either Revlimid or placebo maintenance therapy. Following 2 courses of Revlimid consolidation (25 mg/day, Days 1-21 of a 28-day cycle), the maintenance dose was 10 mg/day continuously (increased up to 15 mg/day after 3 months in the absence of dose-limiting toxicity), and treatment was continued until PD or patient withdrawal for another reason.

In total, 614 patients were randomised: 307 patients to Revlimid and 307 patients to placebo. The demographic and disease-related characteristics were balanced across both arms. The study was unblinded (upon the recommendation of the data monitoring committee) after surpassing the respective threshold for a pre-planned interim analysis of PFS.

The results of PFS at unblinding (following a pre-planned interim analysis) using a cut off of 7 July 2010 (31.4 months median follow-up), and an updated analysis of PFS and OS using a cut off of 1 February 2016 (96.7 months median follow-up), are presented in Table 14:

**Table 14. Summary of Efficacy Data from Study IFM 2005-02**

Endpoint	Revlimid (N = 307)	Placebo (N = 307)
<b>Data at unblinding (7 July 2010)</b>		
<b>Independent Review Committee-assessed PFS (months)</b>		
Median [95% CI]	41.2 [38.3, -]	23.0 [21.2, 28.0]
HR [95% CI]; p-value	0.50 [0.39, 0.64]; p < 0.001	
<b>Data at updated analysis (1 February 2016)</b>		
<b>Investigator-assessed PFS (months)</b>		
Median [95% CI]	44.4 [39.6, 52.0]	23.8 [21.2, 27.3]
HR [95% CI]; p-value	0.57 [0.47, 0.68]; p < 0.001	
<b>Overall survival (months)</b>		
Median [95% CI]	105.9 [88.8, NE]	88.1 [80.7, 108.4]

Endpoint	Revlimid (N = 307)	Placebo (N = 307)
<b>Data at unblinding (7 July 2010)</b>		
<b>Independent Review Committee-assessed PFS (months)</b>		
Median [95% CI]	41.2 [38.3, -]	23.0 [21.2, 28.0]
HR [95% CI]; p-value	0.50 [0.39, 0.64]; p < 0.001	
<b>Data at updated analysis (1 February 2016)</b>		
HR [95% CI]; p-value	0.90 [0.72, 1.13]; ns	

The efficacy of Revlimid maintenance versus placebo/no maintenance as a treatment for adult NDMM patients who have undergone ASCT, as measured by overall survival (OS), was further assessed in a meta-analysis of 3 randomised controlled trials (including Studies CALGB 100104, IFM 2005-02 and GIMEMA). A total of 1209 patients are included in the meta-analysis. The demographic and disease characteristics were reflective of a typical transplant-eligible patient population with NDMM.

For the primary analysis using a cut-off of 1 March 2015, the observed HR was 0.74 for Revlimid versus placebo/no maintenance ([95% CI: 0.62, 0.89]; p = 0.001) indicating a 26% reduction in the risk of death. The median OS was not reached in the Revlimid maintenance pool and was estimated at 86.0 months ([95% CI: 79.8, 96.0]) in the placebo/no maintenance pool.

An updated OS analysis, using a cut-off of 1 February 2016 (88.8 months median follow-up), continued to show an OS advantage for Revlimid versus placebo/no maintenance (Table 15).

**Table 15. Summary of Efficacy Meta-analysis**

Endpoint	Rvlimid Maintenance Pool (N = 605)	Placebo / No Maintenance Pool (N = 604)
<b>Overall survival (months)</b>		
Median [95% CI]	111.0 [100.7, NE]	86.9 [80.5, 96.0]
HR [95% CI]; p-value	0.77 [0.65, 0.91]; p = 0.002	
<b>Follow-up (months)</b>		
Median	89.6	88.2

CI = confidence interval; HR = hazard ratio; NE = not estimable.

### 5.1.3.3 Previously Treated Multiple Myeloma – Revlimid in combination with dexamethasone

The efficacy and safety of Revlimid in MM patients who had received at least one prior treatment were evaluated in two Phase III, multi-centre, randomised, double-blind, placebo-controlled, parallel-group controlled studies (MM-009 and MM-010) of Revlimid plus high-dose dexamethasone therapy versus high-dose dexamethasone alone. Out of 353 patients in the MM-009 and MM-010 studies who received lenalidomide/dexamethasone (Rev/dex), 45.6% were aged 65 or over. Of the 704 patients evaluated in the MM-009 and MM-010 studies, 44.6% were aged 65 or over.

In both studies, patients in the Rev/dex group took 25 mg of Revlimid orally once daily on Days 1 to 21 and a matching placebo capsule once daily on Days 22 to 28 of each 28-day cycle. Patients in the placebo/dexamethasone (placebo/dex) group took 1 placebo capsule on Days 1 to 28 of each 28-day cycle. Patients in both treatment groups took 40 mg of dexamethasone orally once daily on Days 1 to 4, 9 to 12, and 17 to 20 of each 28-day cycle for the first 4 cycles of therapy. The dose of dexamethasone was reduced to 40 mg orally once daily on Days 1 to 4 of each 28-day cycle after the first 4 cycles of therapy.

In both studies, treatment was to continue until disease progression. In both studies, dose adjustments were allowed based on clinical and laboratory finding.

The primary efficacy endpoint in both studies was time-to-progression (TTP). In total, 353 patients were evaluated in the MM-009 study (177 in the Rev/dex group and 176 in the placebo/dex group) and, in total, 351 patients were evaluated in the MM-010 study (176 in the Rev/dex group and 175 in the placebo/dex group).

In both studies, the baseline demographic and disease-related characteristics were comparable between the Rev/dex and placebo/dex groups. Both patient populations presented a median age of 63 years, with a comparable male to female ratio. The ECOG performance status was comparable between both groups, as were the number and type of prior therapies.

Pre-planned interim analyses of both studies showed that Rev/dex was statistically significantly superior ( $p < 0.00001$ ) to dexamethasone alone for the primary efficacy endpoint, TTP. CR and overall response (OR) rates in the Rev/dex arm were also significantly higher than the placebo/dex arm in both studies. An extended follow-up efficacy analysis was conducted with a median follow-up of 30.2 months. Table 16 summarises the results of the follow-up efficacy analyses.

**Table 16: Summary of Efficacy Analyses - Studies MM-009 and MM-010**

Endpoint	MM-009		MM-010	
	Rev/dex N = 177	Placebo/Dex N = 176	Rev/dex N = 176	Placebo/Dex N = 175
<b>TTP (months)</b>				
Median [95% CI]	13.9 [9.5, 17.1]	4.6 [3.7, 5.1]	12.1 [9.4, 19.8]	4.6 [3.8, 4.8]
HR [95% CI]; p-value	0.33 [0.25, 0.44]; $p < 0.001$		0.36 [0.27, 0.48]; $p < 0.001$	
<b>Response Rate</b>				
CR, n (%)	28 (16)	4 (2)	30 (17)	7 (4)
PR, n (%)	79 (45)	30 (17)	75 (43)	34 (19)
p-value	$< 0.001$		$< 0.001$	
<b>PFS (months)</b>				
Median [95% CI]	12.3 [8.4, 16.7]	4.6 [3.7, 4.7]	10.2 [7.4, 15.2]	4.6 [3.7, 4.7]
HR [95% CI]; p-value	0.36 [0.27, 0.47]; $p < 0.001$		0.42 [0.32, 0.55]; $p < 0.001$	

CI = confidence interval; CR = complete response; HR = hazard ratio; PFS = progression-free survival; PR = partial response; TTP = time to progression.

#### 5.1.3.4 Myelodysplastic Syndromes - Revlimid

The efficacy and safety of Revlimid were evaluated in low- or intermediate-1-risk MDS patients with a deletion-5q (q31-33) cytogenetic abnormality, with or without additional cytogenetic abnormalities, were evaluated in two studies: MDS-003 and MDS-004.

Study MDS-004 was a Phase III, multi-centre, randomised, double-blind, placebo-controlled study in red blood cell (RBC) transfusion-dependent patients. The 52-week double-blind treatment phase included 205 patients who were randomised to receive 10 mg Revlimid for 21 days of a 28-day cycle, 5 mg Revlimid continuously, or placebo. The primary efficacy endpoint was transfusion independence at 182 days. The median age of patients was 68.0 years (range 36 to 86), the median duration of MDS was 2.6 years (range 0.2 to 29.2) and 76.1% of patients were females. The study enrolled patients with absolute neutrophil counts (ANC)  $\geq 0.5 \times 10^9/L$ , platelet counts  $\geq 25 \times 10^9/L$ , serum creatinine  $\leq 2.0$  mg/dL, serum SGOT/AST or SGPT/ALT  $\leq 3.0$  x upper limit of normal (ULN), and serum total bilirubin  $\leq 1.5$  mg/dL. An overview of the efficacy results for the Intent-to-Treat (ITT) populations from MDS-004 receiving either cyclic Revlimid dosing at 10 mg, or placebo, is presented in Table 17.

Study MDS-003 was a Phase II, multi-centre, open-label, single-arm study of 148 patients who were RBC transfusion-dependent. Dosing was primarily at a continuous dose of 10 mg once daily for 28 days, with some experience at a dose of 10 mg daily for 21 of 28 days. The primary efficacy endpoint was RBC transfusion independence of at least 2 months duration, as defined by the MDS International Working Group (IWG) criteria. The median age of patients was 71.0 years (range 37 to 95), the median duration of MDS was 2.5 years (range 0.1 to 20.7) and 65.5% of patients were females. The study enrolled patients with absolute neutrophil counts (ANC)  $\geq 0.5 \times 10^9/L$ , platelet counts  $\geq 50 \times 10^9/L$ , serum creatinine  $\leq 2.5$  mg/dL, serum SGOT/AST or SGPT/ALT  $\leq 3.0$  x upper limit of normal (ULN), and serum direct bilirubin  $\leq 2.0$  mg/dL. Table 16 summarises the efficacy results for the ITT population from MDS-003.

In both MDS-003 and MDS-004, granulocyte colony-stimulating factor was permitted for patients who developed neutropenia or fever in association with neutropenia.

**Table 17: Summary of Efficacy Analyses - Studies MDS-003 and MDS-004**

Endpoint	MDS-003	MDS-004*	
	10 mg Continuous	10 mg Cyclic	Placebo
Number RBC-Transfusion Independent at 56 days <sup>a</sup>	97 (65.5%) N=148	42 (60.9%) N=69	5 (7.5%) N=67
Number RBC-Transfusion Independent at 182 days <sup>b</sup>	nr	38 (55.1%) N=69	4 (6.0%) N=67
Median time (range) to transfusion independence (weeks) <sup>c</sup>	4.1 (0.3, 49.0) N=97	4.6 (0.3, 14.7) N=42	0.3 (0.3, 24.1) N=5
Median [95% CI] duration of RBC-transfusion independence (weeks)	114.4 [78.4 – 153.7] N=97	NE [98.3 – NE] N=42	NE [9.1 – NE] N=5
Durability of response – subjects who maintained transfusion independence <sup>d</sup>	40 (41.2%) N=97	30 (71.4%) N=42	4 (80.0%) N=5
Median rise in haemoglobin (g/dL) (range)	5.6 (2.2, 40.7) N=97	6.2 (1.8, 10.0) N=42	2.6 (1.5, 4.4) N=5

Continuous = (28 days of a 28-day cycle); Cyclic = (21 days of a 28-day cycle); CI = confidence interval; RBC = red blood cell; Hb = haemoglobin; NE = not estimable; nr = not reported.

\*: Based on RBC-transfusion independence response for subjects who became RBC-transfusion independent for at least 56 days.

a: transfusion independence was defined as the absence of any RBC transfusion during any consecutive 56 days during the treatment period accompanied by at least a 1 g/dL increase in Hb from screening/baseline.

b: RBC-transfusion independence response for subjects who became RBC-transfusion independent for at least 182 days.

c: Measured from the day of the first dose of study drug to the first day of the first 56-day RBC transfusion-free period.

d: Measured from the first of the consecutive 56 days during which the subject was free of RBC transfusions to the date of the first RBC transfusion after this period.

### 5.1.3.5 Previously Treated Mantle Cell Lymphoma - Revlimid

The efficacy and safety of Revlimid were evaluated in subjects with relapsed/refractory mantle cell lymphoma (MCL) were evaluated in Study MCL-002.

Study MCL-002 was a Phase II, multicenter, randomised, open-label, controlled study to compare the efficacy and safety of single-agent Revlimid versus single agent of investigator's choice (IC) in subjects with MCL who were refractory to their last regimen or had between 1 and 3 relapses. Patients were randomised 2:1 to the Revlimid or the control arm. The IC treatment (control arm) was selected before randomisation and consisted of monotherapy with either chlorambucil, cytarabine, rituximab, fludarabine, or gemcitabine.

Revlimid was administered orally 25 mg once daily for the first 21 days (Day 1 to 21) of repeating 28-day cycles until progression or unacceptable toxicity. Patients with moderate renal insufficiency were to receive a lower starting dose of Revlimid 10 mg daily on the same schedule.

The primary efficacy endpoint in Study MCL-002 was PFS defined as the time from randomisation to the first observation of disease progression or death due to any cause. OS was a secondary endpoint. Revlimid significantly reduced the PFS risk by 39% compared to the control arm (HR 0.61 [95% CI: 0.44, 0.84]; p = 0.004). There was a significant improvement in median PFS for Revlimid (37.6 weeks [8.7 months]) compared to control (22.7 weeks [5.2 months]).

The key efficacy results from Study MCL-002 are presented in Table 18 below:

**Table 18: Summary of Efficacy Analyses for Study MCL-002**

Endpoint	Revlimid Arm (N = 170)	Control Arm (N = 84)
<b>PFS</b>		
Median [95% CI] (weeks)	37.6 [24.0, 52.6]	22.7 [15.9, 30.1]
Sequential HR [95% CI]; p-value	0.61 [0.44, 0.84]; p = 0.004	
<b>Response, n (%)</b>		
CR	8 (4.7)	0 (0.0)
PR	60 (35.3)	9 (10.7)
SD	50 (29.4)	44 (52.4)
PD	34 (20.0)	26 (31.0)
Not done / missing	18 (10.6)	5 (6.0)
<b>ORR (CR, Cru, PR)</b>		
n (%) [95% CI]	68 (40.0) [32.6, 47.8]	9 (10.7) [5.0, 19.4]
p-value	< 0.001	
<b>CRR (CR, Cru)</b>		
n (%) [95% CI]	8 (4.7) [2.1, 9.1]	0 (0.0) [0.0, 4.3]
p-value	0.043	
<b>DOR</b>		
Median [95% CI] (weeks)	69.6 [41.1, 86.7]	45.1 [36.3, 80.9]
HR [95% CI]	0.70 [0.29, 1.68]	
p-value	0.421	
<b>TTP</b>		
Median [95% CI] (weeks)	39.3 [24.3, 52.9]	24.7 [15.9, 30.1]
HR [95% CI]; p-value	0.62 [0.45, 0.87]; p = 0.005	
<b>OS</b>		
Median [95% CI] (weeks)	121.0 [86.7, 160.4]	91.7 [69.4, 125.6]
HR [95% CI]; p-value	0.89 [0.62, 1.28]; p = 0.519	

CI = confidence interval; CR = complete response; CRR = complete response rate; CRu = complete response unconfirmed; DOR = duration of response; HR = hazard ratio; ORR = overall response rate; OS = overall survival; PD = progressive disease; PFS = progression-free survival; PR = partial response; SD = stable disease; TTP = time to progression.

## 5.2 PHARMACOKINETIC PROPERTIES

### 5.2.1 Absorption

In healthy volunteers, Revlimid is rapidly absorbed following oral administration with maximum plasma concentrations occurring between 0.6 and 1.5 hours post-dose. The maximum concentration ( $C_{max}$ ) and area-under-the-concentration versus time curve (AUC) increase proportionately with increases in dose. Multiple dosing does not cause marked drug accumulation. In plasma, the relative exposures of the S- and

R- enantiomers of lenalidomide are approximately 56% and 44%, respectively. The absolute bioavailability of lenalidomide has not been determined.

Co-administration with a high-fat and high-calorie meal in healthy volunteers reduces the extent of absorption, resulting in an approximately 20% decrease in AUC and 50% decrease in the  $C_{\max}$  in plasma.

The pharmacokinetics of lenalidomide were very similar in subjects with myelodysplastic syndromes (MDS) compared to subjects with MM. In patients with low- or intermediate-1-risk MDS, a single 10 mg oral dose of Revlimid was rapidly absorbed with a median time to maximum concentration ( $t_{\max}$ ) of around 1 hour post-dose. The mean terminal half-life ( $t_{1/2}$ ) was approximately 4 hours. Following multiple dosing of 10 mg per day for 14 days, there was no accumulation of lenalidomide in plasma, with the mean plasma exposure ( $C_{\max}$  and AUC) and renal clearance at the steady-state comparable to those observed with a single dose. The plasma concentrations 1 hour after dosing were relatively stable for 280 days.

### 5.2.2 Distribution

*In vitro* ( $^{14}\text{C}$ )-lenalidomide binding to plasma proteins was low with mean plasma protein binding at 22.7% and 29.2% in MM patients and healthy volunteers, respectively.

### 5.2.3 Metabolism and Excretion

*In vitro* studies indicate that lenalidomide has no inhibitory effect on CYP1A2, CYP2C9, CYP2C19, CYP2D6, CYP2E1 and CYP3A.

A majority of lenalidomide is eliminated unchanged through urinary excretion. The contribution of renal excretion to total clearance in subjects with normal renal function was 65 - 85%. The  $t_{1/2}$  of elimination has been observed to increase with dose, from approximately 3 hours at 5 mg up to approximately 9 hours at doses of 400 mg (the higher dose is believed to provide a better estimate of  $t_{1/2}$ ). Steady-state levels are achieved by Day 4.

Following a single oral administration of [ $^{14}\text{C}$ ]-lenalidomide (25 mg) to healthy volunteers, approximately 90% and 4% of the radioactive dose is eliminated in urine and faeces, respectively. Approximately 82% of the radioactive dose is excreted as lenalidomide, almost exclusively via the urinary route. Hydroxy-lenalidomide and N-acetyl-lenalidomide represent 4.59% and 1.83% of the excreted dose, respectively. The renal clearance of lenalidomide exceeds the glomerular filtration rate and therefore is at least actively secreted to some extent.

Pharmacokinetic analyses in patients with impaired renal function indicate that as renal function decreases (< 50 mL/min), the total drug clearance decreases proportionally resulting in an increase in AUC. The  $t_{1/2}$  of lenalidomide increased from approximately 3.5 hours in subjects with creatinine clearance > 50 mL/min to more than 9 hours in subjects with reduced renal function (< 50 mL/min). However, renal impairment did not alter the oral absorption of lenalidomide. The  $C_{\max}$  was similar between healthy subjects and patients with renal impairment. Recommended dose adjustments in patients with impaired renal function are described in Section 4.2.2 (Dose Adjustments).

Pharmacokinetic analyses based on MM studies indicate that lenalidomide is rapidly absorbed at all dose levels, with maximum plasma concentrations occurring between 0.5 and 4.0 hours post-dose both on Days 1 and 28. The  $C_{\max}$  and AUC values increase proportionally with dose following single and multiple doses in MM patients. Exposure in MM patients is slightly higher based on  $C_{\max}$  and AUC values as compared to healthy male volunteers since the clearance/bioavailable fraction of a drug (CL/F) in MM patients is lower (approximately 200 mL/min compared to 300 mL/min) than it is in healthy volunteers. This is consistent with the compromised renal function in the MM patients, possibly as a consequence of their age (average patient age of 58 vs. 29 for healthy volunteers) and their disease.

## 5.3 PRECLINICAL SAFETY DATA

### 5.3.1 Genotoxicity

*In vitro* (mutation in bacteria, chromosomal aberration in human lymphocytes, mutation in mouse lymphoma cells, and Syrian Hamster Embryo cell transformation) and *in vivo* (rat micronucleus) genotoxicity studies revealed no drug-related effects at either the gene or chromosomal level.

### 5.3.2 Carcinogenicity

Carcinogenicity studies with Revlimid have not been conducted.

## 6 PHARMACEUTICAL PARTICULARS

### 6.1 LIST OF EXCIPIENTS

Revlimid capsules contain the following excipients: lactose; cellulose, microcrystalline; croscarmellose sodium; and magnesium stearate.

The capsule shells contain gelatine, titanium dioxide (E171), black ink, and the following colourants: 2.5 mg (FD&C Blue#2 [indigo carmine; E132], and yellow iron oxide [E172]); 7.5 mg (yellow iron oxide [E172]); 10 mg (FD&C Blue#2 [E132], and yellow iron oxide [E172]); 15 mg (FD&C Blue#2 [E132]; and 20 mg (FD&C Blue#2 [E132], and yellow iron oxide [E172]).

The black printing ink used on the capsules contains shellac, ethanol, isopropyl alcohol, butan-1-ol, propylene glycol, water-purified, strong ammonia solution, potassium hydroxide, and black iron oxide [E172].

### 6.2 INCOMPATIBILITIES

Incompatibilities were either not assessed or not identified as part of the registration of this medicine.

### 6.3 SHELF LIFE

3 Years.

### 6.4 SPECIAL PRECAUTIONS FOR STORAGE

Store below 25°C. Store in the original package.

### 6.5 NATURE AND CONTENTS OF CONTAINER

Polychlorotrifluoroethylene (PCTFE) / polyvinylchloride (PVC) / Aluminium foil blisters.

Revlimid 2.5 mg, 5 mg, 7.5 mg, 10 mg, 15 mg, 20 mg and 25 mg capsules.

Pack size of 21 capsules. However, not all strengths are being distributed in Australia.

Revlimid 5 mg, 10 mg and 15 mg capsules.

Pack size of 28 capsules.

Revlimid 5 mg, 10 mg, 15 mg and 25 mg capsules.

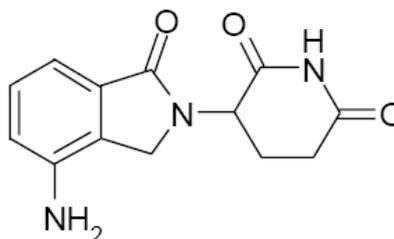
Pack size of 14 capsules. However, not all strengths are being distributed in Australia.

## 6.6 SPECIAL PRECAUTIONS FOR DISPOSAL

In Australia, any unused medicine or waste material should be disposed of by taking to your local pharmacy.

## 6.7 PHYSICOCHEMICAL PROPERTIES

Molecular formula:	C <sub>13</sub> H <sub>13</sub> N <sub>3</sub> O <sub>3</sub>
Molecular weight:	259.25 g/mol
ATC code:	L04 AX04
Chemical name:	3-(4'-amino-1,3-dihydro-1-oxo-2H-isoindol-2-yl)-2,6-piperidinedione
Chemical Abstract Service (CAS) registry number:	191732-72-6
Chemical structure:	



## 7 MEDICINE SCHEDULE (POISONS STANDARD)

Schedule 4 (Prescription Only Medicine)

## 8 SPONSOR

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## 9 DATE OF FIRST APPROVAL

20 December 2007

## 10 DATE OF REVISION

27 August 2019

## SUMMARY TABLE OF CHANGES

<b>Section Changed</b>	<b>Summary of New Information</b>
4.2.2.2	Updated to add 'anaphylaxis' for dose discontinuation.
4.4.7	Updated to add 'anaphylaxis' under the heading 'Allergic Reactions and Serious Skin Reaction'.
4.4.8.3	Updated to add 'anaphylaxis' as a Post-Marketing Experience.