

## LOGEM



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### 1. Product Name

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LOGEM 25 mg, 50 mg, 100 mg, 200 mg chewable/dispersible tablets.

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### 2. Qualitative and Quantitative Composition

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Each chewable/dispersible tablet contains 25 mg, 50 mg, 100 mg or 200 mg of lamotrigine.

For the full list of excipients, see section 6.1.

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### 3. Pharmaceutical Form

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LOGEM 25 mg chewable/dispersible tablets: White to off-white, round, flat-faced, bevelled edge tablets with "LY" over "25" on one side and plain on the other.

LOGEM 50 mg chewable/dispersible tablets: White to off-white, round, flat-faced, bevelled edge tablets with "LY" over "50" on one side and plain on the other.

LOGEM 100 mg chewable/dispersible tablets: White to off-white, round, flat-faced, bevelled edge tablets with "LY" over "100" on one side and plain on the other.

LOGEM 200 mg chewable/dispersible tablets: White to off-white, round, flat-faced, bevelled edge tablets with "LY" over "200" on one side and plain on the other.

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### 4. Clinical Particulars

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#### 4.1 Therapeutic indications

##### Epilepsy

###### *Adults (over 12 years of age)*

LOGEM is indicated as adjunctive therapy in the treatment of epilepsy, for partial seizures and generalized seizures, including tonic-clonic seizures and the seizures associated with Lennox-Gastaut Syndrome.

###### *Children (2 to 12 years of age)*

LOGEM is indicated as adjunctive therapy in the treatment of epilepsy, for partial seizures and generalised seizures including tonic-clonic seizures and the seizures associated with Lennox-Gastaut syndrome.

##### Bipolar Disorder

###### *Adults (18 years of age and over)*

LOGEM is indicated for the prevention of mood episodes in patients with bipolar disorder, predominantly by preventing depressive episodes.

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## **4.2 Dose and method of administration**

### **Dose**

If a calculated dose of lamotrigine (e.g. for use in children (epilepsy only) or patients with hepatic impairment) cannot be divided into multiple lower strength tablets, the dose to be administered is that equal to the nearest lower strength of whole tablets.

### **Restarting therapy**

Prescribers should assess the need for escalation to maintenance dose when restarting lamotrigine in patients who have discontinued lamotrigine for any reason, since the risk of serious rash is associated with high initial doses and exceeding the recommended dose escalation for lamotrigine (see section 4.4).

The greater the interval of time since the previous dose, the more consideration should be given to escalation to the maintenance dose. When the interval since discontinuing lamotrigine exceeds five half-lives (see section 5.2), lamotrigine should generally be escalated to the maintenance dose according to the appropriate schedule.

It is recommended that lamotrigine not be restarted in patients who have discontinued due to rash associated with prior treatment with lamotrigine unless the potential benefit clearly outweighs the risk.

### **Epilepsy**

#### ***Dosage in epilepsy add-on therapy***

##### **Adults (over 12 years of age)**

In patients taking valproate with/without any other anti-epileptic medicine (AEM), the initial lamotrigine dose is 25 mg every alternate day for two weeks, followed by 25 mg once a day for two weeks. Thereafter, the dose should be increased by a maximum of 25 - 50 mg every 1 - 2 weeks until the optimal response is achieved. The usual maintenance dose to achieve optimal response is 100-200 mg/day given once a day or in two divided doses.

In those patients taking concomitant AEMs or other medications (see section 4.5) that induce lamotrigine glucuronidation with/without other AEMs (except valproate), the initial lamotrigine dose is 50 mg once a day for two weeks, followed by 100 mg/day given in two divided doses for two weeks.

Thereafter, the dose should be increased by a maximum of 100 mg every 1 - 2 weeks until the optimal response is achieved. The usual maintenance dose to achieve optimal response is 200 - 400 mg/day given in two divided doses.

Some patients have required 700 mg/day of lamotrigine to achieve the desired response.

In patients taking other medications that do not significantly inhibit or induce lamotrigine glucuronidation (see section 4.5), the initial lamotrigine dose is 25 mg once a day for two weeks, followed by 50 mg once a day for two weeks. Thereafter, the dose should be increased by a maximum of 50 to 100 mg every one to two weeks until the optimal response is achieved. The usual maintenance dose to achieve optimal response is 100 to 200 mg/day given once a day or as two divided doses.

**Table 1: Recommended treatment regimen in epilepsy for adults over 12 years of age**

Treatment regimen		Weeks 1 & 2	Weeks 3 & 4	Maintenance dose
Add-on therapy with valproate regardless of any concomitant medications		12.5 mg (given 25 mg alternate days)	25 mg (once a day)	100 – 200 mg (once a day or two divided doses). To achieve maintenance, doses may be increased by 25-50 mg every one to two weeks
Add-on therapy without valproate	This dosage regimen should be used with: Phenytoin Carbamazepine Phenobarbitone Primidone Or with other inducers of lamotrigine glucuronidation (see section 4.5).	50 mg (once a day)	100 mg (two divided doses)	200 – 400 mg (two divided doses). To achieve maintenance, doses may be increased by 100 mg every one to two weeks
	This dosage should be taken with other medications that do not significantly inhibit or induce lamotrigine glucuronidation (see section 4.5).	25 mg (once a day)	50 mg (once a day)	100 – 200 mg (once a day or two divided doses) To achieve maintenance, doses may be increased by 50 – 100 mg every one to two weeks
NOTE: In patients taking anti-epileptic medicines where the pharmacokinetic interaction with lamotrigine is currently not known (see section 4.5), the treatment regimen as recommended for lamotrigine with concurrent valproate should be used.				

Because of a risk of rash, the initial dose and subsequent dose escalation should not be exceeded (see section 4.4).

### Children (2 to 12 years of age)

In patients taking valproate with/without any other AEM, the initial lamotrigine dose is 0.15 mg/kg bodyweight/day given once a day for two weeks, followed by 0.3 mg/kg/day once a day for two weeks. Thereafter, the dose should be increased by a maximum of 0.3 mg/kg every 1 - 2 weeks until the optimal response is achieved. The usual maintenance dose to achieve optimal response is 1 - 5 mg/kg/day given once a day or in two divided doses, with a maximum of 200 mg/day.

In those patients taking concomitant AEMs or other medications (see section 4.5) that induce lamotrigine glucuronidation with/without other AEMs (except valproate), the initial lamotrigine dose is 0.6 mg/kg bodyweight/day given in two divided doses for two weeks, followed by 1.2 mg/kg/day given in two divided doses for two weeks. Thereafter, the dose should be increased by a maximum of 1.2 mg/kg every 1 - 2 weeks until the optimal response is achieved. The usual maintenance

dose to achieve optimal response is 5 - 15 mg/kg/day given in two divided doses, with a maximum of 400 mg/day.

In patients taking other medications that do not significantly inhibit or induce lamotrigine glucuronidation (see section 4.5), the initial lamotrigine dose is 0.3 mg/kg bodyweight/day given once a day or in two divided doses for two weeks, followed by 0.6 mg/kg/day given once a day or in two divided doses for two weeks. Thereafter, the dose should be increased by a maximum of 0.6 mg/kg every one to two weeks until the optimal response is achieved. The usual maintenance dose to achieve optimal response is 1 to 10 mg/kg/day given once a day or in two divided doses, with a maximum of 200 mg/day.

To ensure a therapeutic dose is maintained, the weight of a child must be monitored and the dose reviewed as weight changes occur.

**Table 2: Recommended treatment regimen in epilepsy for children aged 2-12 years (total daily dose in mg/kg bodyweight/day)**

Treatment regimen		Weeks 1 & 2	Weeks 3 & 4	Maintenance Dose
Add-on therapy with valproate regardless of any other concomitant medication		0.15 mg/kg (once a day)	0.3 mg/kg (once a day)	0.3 mg/kg increments every one to two weeks to achieve a maintenance dose of 1 – 5 mg/kg (once a day or two divided doses) to a maximum of 200 mg/day
Add-on therapy without valproate	This dosage regimen should be used with: Phenytoin Carbamazepine Phenobarbitone Primidone Or with other inducers of lamotrigine glucuronidation (see section 4.5).	0.6 mg/kg (two divided doses)	1.2 mg/kg (two divided doses)	1.2 mg/kg increments every one to two weeks to achieve a maintenance dose of 5 – 15 mg/kg (once a day or two divided doses) to a maximum of 400 mg/day
	This dosage should be taken with other medications that do not significantly inhibit or induce lamotrigine glucuronidation (see section 4.5).	0.3 mg/kg (one or two divided doses)	0.6 mg/kg (one or two divided doses)	0.6 mg/kg increments every one to two weeks to achieve a maintenance dose of 1 – 10 mg/kg (once a day or two divided doses) to a maximum of 200 mg/day
In patients taking AEMs where the pharmacokinetic interaction with lamotrigine is currently not known (see section 4.5), the treatment regimen as recommended for lamotrigine with concurrent valproate should be used.				
NOTE: If the calculated daily dose in patients taking valproate is 1 to 2 mg, then 2 mg lamotrigine may be taken on alternate days for the first two weeks. If the calculated daily dose in patients taking valproate is less than 1 mg, then lamotrigine should not be administered.				

Because of a risk of rash, the initial dose and subsequent dose escalation should not be exceeded (see section 4.4).

It is likely that patients aged 2 - 6 years will require a maintenance dose at the higher end of the recommended range.

### Children aged less than 2 years

Lamotrigine has not been studied as monotherapy in children less than 2 years of age or as add-on therapy in children less than 1 month of age. The safety and efficacy of lamotrigine as add-on therapy of partial seizures in children aged 1 month to 2 years has not been established (see section 5.1). Therefore, lamotrigine is not recommended in children less than 2 years of age.

### General dosing recommendations for epilepsy

When other anti-epileptic medicines (AEMs) are added-on to treatment regimens containing lamotrigine, consideration should be given to the effect this may have on lamotrigine pharmacokinetics (see section 4.5).

### Bipolar Disorder

#### Adults (18 years of age and over)

Because of the risk of rash, the initial dose and subsequent dose escalation should not be exceeded (see section 4.4).

Lamotrigine is recommended for use in bipolar patients at risk of a future depressive episode.

The following transition regimen should be followed to prevent recurrence of depressive episodes. The transition regimen involves escalating the dose of lamotrigine to a maintenance stabilisation dose over six weeks after which other psychotropic and/or anti-epileptic medicines can be withdrawn, if clinically indicated.

Adjunctive therapy should be considered for the prevention of manic episodes, as efficacy with lamotrigine in mania has not been conclusively established.

**Table 3: Recommended dose escalation to the maintenance total daily stabilisation dose for adults (over 18 years of age) treated for bipolar disorder**

Treatment Regimen	Weeks 1&2	Weeks 3&4	Week 5	Target Stabilisation Dose (Week 6)**
<b>a) Adjunct therapy with inhibitors of lamotrigine glucuronidation e.g. valproate</b>	12.5 mg (given 25 mg alternate days)	25 mg (once a day)	50 mg (once a day or two divided doses)	100 mg (once a day or two divided doses) (maximum daily dose of 200 mg)
<b>b) Adjunct therapy with inducers of lamotrigine glucuronidation in patients NOT taking inhibitors such as valproate.</b>  <b>This dosage regimen should be used with:</b>  <b>Phenytoin</b> <b>Carbamazepine</b> <b>Phenobarbitone</b> <b>Primidone</b>  <b>Or with other inducers of lamotrigine glucuronidation (see</b>	50 mg (once a day)	100 mg (two divided doses)	200 mg (two divided doses)	300 mg in week 6, increasing to 400 mg/day if necessary in week 7 (two divided doses)

<b>section 4.5)</b>				
<b>c) Adjunct therapy in patients taking other medications that do not significantly inhibit or induce lamotrigine glucuronidation (see section 4.5) OR Monotherapy with lamotrigine</b>	25 mg (once a day)	50 mg (once a day or two divided doses)	100 mg (once a day or two divided doses)	200 mg (Range 100 - 400 mg) (once a day or two divided doses)
NOTE: In patients taking AEMs where the pharmacokinetic interaction with lamotrigine is currently not known, the dose escalation as recommended for lamotrigine with concurrent valproate, should be used.				

\*\*The target stabilisation dose will alter depending on clinical response.

**a) Adjunct therapy with inhibitors of lamotrigine glucuronidation e.g. valproate**

In patients taking glucuronidation inhibiting concomitant medicines such as valproate the initial lamotrigine dose is 25 mg every alternate day for two weeks, followed by 25 mg once a day for two weeks. The dose should be increased to 50 mg once a day (or in two divided doses) in week 5. The usual target dose to achieve optimal response is 100 mg/day given once a day or in two divided doses. However, the dose can be increased to a maximum daily dose of 200 mg, depending on clinical response.

**b) Adjunct therapy with inducers of lamotrigine glucuronidation in patients NOT taking inhibitors such as valproate. This dosage regimen should be used with phenytoin, carbamazepine, phenobarbitone, primidone and other medicines known to induce lamotrigine glucuronidation (see section 4.5).**

In those patients currently taking medicines that induce lamotrigine glucuronidation and NOT taking valproate, the initial lamotrigine dose is 50 mg once a day for two weeks, followed by 100 mg/day given in two divided doses for two weeks. The dose should be increased to 200 mg/day given as two divided doses in week 5. The dose may be increased in week 6 to 300 mg/day, however, the usual target dose to achieve optimal response is 400 mg/day given in two divided doses which may be given from week 7.

**c) Adjunct therapy in patients taking other medications that do not significantly induce or inhibit lamotrigine glucuronidation (see section 4.5).**

The initial lamotrigine dose is 25 mg once a day for two weeks, followed by 50 mg once a day (or in two divided doses) for two weeks. The dose should be increased to 100 mg/day in week 5. The usual target dose to achieve optimal response is 200 mg/day given once a day or as two divided doses. However, a range of 100 - 400 mg was used in clinical trials. Once the target daily maintenance stabilisation dose has been achieved, other psychotropic medications may be withdrawn as laid out in the dosage schedule below.

**Table 4: Maintenance stabilisation total daily dose in bipolar disorder following withdrawal of concomitant psychotropic or anti-epileptic medicines**

Treatment Regimen	Week 1	Week 2	Week 3 onwards*
<b>(a) Following withdrawal of inhibitors of lamotrigine glucuronidation e.g. valproate</b>	Double the stabilisation dose, not exceeding 100 mg/week i.e. 100 mg/day target stabilisation dose will be increased in week 1 to 200 mg/day	Maintain this dose (200 mg/day) (two divided doses)	
<b>(b) Following withdrawal of inducers of lamotrigine glucuronidation depending on original dose.</b>  <b>This dosage regimen should be used with:</b>  <b>Phenytoin</b> <b>Carbamazepine</b> <b>Phenobarbitone</b> <b>Primidone</b>  <b>Or with other inducers of lamotrigine glucuronidation (see section 4.5).</b>	400 mg	300 mg	200 mg
	300 mg	225 mg	150 mg
	200 mg	150 mg	100 mg
<b>(c) Following withdrawal of other medications that do not significantly inhibit or induce lamotrigine glucuronidation (see section 4.5)</b>	Maintain target dose achieved in dose escalation (200 mg/day) (two divided doses)  (Range 100 - 400 mg)		
NOTE: In patients taking AEMs where the pharmacokinetic interaction with lamotrigine is currently not known, the treatment regimen recommended for lamotrigine is to initially maintain the current dose and adjust the lamotrigine treatment based on clinical response.			

\* Dose may be increased to 400 mg/day as needed

**(a) Following withdrawal of adjunct therapy with inhibitors of lamotrigine glucuronidation e.g. valproate**

The dose of lamotrigine should be increased to double the original target stabilisation dose and maintained at this, once valproate has been terminated.

**(b) Following withdrawal of adjunct therapy with inducers of lamotrigine glucuronidation, depending on original maintenance dose. This regimen should be used with phenytoin, carbamazepine, phenobarbitone, primidone or other medicines known to induce lamotrigine glucuronidation (see section 4.5).**

The dose of lamotrigine should be gradually reduced over 3 weeks as the glucuronidation inducer is withdrawn.

**(c) Following withdrawal of adjunct therapy with other medications that do not significantly inhibit or induce lamotrigine glucuronidation (see section 4.5).**

The target dose achieved in the dose escalation programme should be maintained throughout withdrawal of the other medication.

**Adjustment of lamotrigine daily dosing in patients with bipolar disorder following addition of other medications**

There is no clinical experience in adjusting the lamotrigine daily dose following the addition of other medications. However, based on medicine interaction studies, the following recommendations can be made:

**Table 5: Adjustment of lamotrigine daily dosing in patients with bipolar disorder following the addition of other medications**

Treatment Regimen	Current lamotrigine stabilisation dose (mg/day)	Week 1	Week 2	Week 3 onwards
<b>(a) Addition of inhibitors of lamotrigine glucuronidation e.g. valproate, depending on original dose of lamotrigine</b>	200 mg	100 mg	Maintain this dose (100 mg/day)	
	300 mg	150 mg	Maintain this dose (150 mg/day)	
	400 mg	200 mg	Maintain this dose (200 mg/day)	
<b>(b) Addition of inducers of lamotrigine glucuronidation in patients NOT taking valproate and depending on original dose of lamotrigine.</b>  This dosage regimen should be used with:  Phenytoin Carbamazepine Phenobarbitone Primidone  Or with other inducers of lamotrigine glucuronidation (see section 4.5).	200 mg	200 mg	300 mg	400 mg
	150 mg	150 mg	225 mg	300 mg
	100 mg	100 mg	150 mg	200 mg
<b>(c) Addition of other medications that do not significantly inhibit or induce lamotrigine glucuronidation (see section 4.5).</b>	Maintain target dose achieved in dose escalation (200 mg/day) (range 100 - 400 mg)			
NOTE: In patients taking AEMs where the pharmacokinetic interaction with lamotrigine is currently not known, the treatment regimen as recommended for lamotrigine with concurrent valproate should be used.				



## **Discontinuation of lamotrigine in patients with bipolar disorder**

In clinical trials, there was no increase in the incidence, severity or type of adverse experiences following abrupt termination of lamotrigine versus placebo. Therefore, patients may terminate lamotrigine without a step-wise reduction of dose.

## **Children and adolescents (less than 18 years of age)**

Lamotrigine is not indicated for use in bipolar disorder in children and adolescents aged less than 18 years (see section 4.4). Safety and efficacy of lamotrigine in bipolar disorder has not been evaluated in this age group. Therefore, a dosage recommendation cannot be made.

## **Special populations**

### ***Women taking hormonal contraceptives***

(a) Starting lamotrigine in patients already taking hormonal contraceptives:

Although an oral contraceptive has been shown to increase the clearance of lamotrigine (see sections 4.4 and 4.5), no adjustments to the recommended dose escalation guidelines for lamotrigine should be necessary solely based on the use of hormonal contraceptives. Dose escalation should follow the recommended guidelines based on whether lamotrigine is added to valproate (an inhibitor of lamotrigine glucuronidation) or to an inducer of lamotrigine glucuronidation, or whether lamotrigine is added in the absence of valproate or an inducer of lamotrigine glucuronidation.

(b) Starting hormonal contraceptives in patients already taking maintenance doses of lamotrigine and NOT taking inducers of lamotrigine glucuronidation:

The maintenance dose of lamotrigine will in most cases need to be increased by as much as two-fold (see sections 4.4 and 4.5). It is recommended that from the time that the hormonal contraceptive is started, the lamotrigine dose is increased by 50 to 100 mg/day every week, according to the individual clinical response. Dose increases should not exceed this rate, unless the clinical response supports larger increases.

(c) Stopping hormonal contraceptives in patients already taking maintenance doses of lamotrigine and NOT taking inducers of lamotrigine glucuronidation:

The maintenance dose of lamotrigine will in most cases need to be decreased by as much as 50% (see sections 4.4 and 4.5). It is recommended to gradually decrease the daily dose of lamotrigine by 50 to 100 mg each week (at a rate not exceeding 25% of the total daily dose per week) over a period of 3 weeks, unless the clinical response indicates otherwise.

### ***Use with atazanavir/ritonavir***

Although atazanavir/ritonavir has been shown to reduce lamotrigine plasma concentrations (see section 4.5), no adjustments to the recommended dose escalation guidelines for lamotrigine should be necessary solely based on the use of atazanavir/ritonavir. Dose escalation should follow the recommended guidelines based on whether lamotrigine is added to valproate (an inhibitor of lamotrigine glucuronidation), or to an inducer of lamotrigine glucuronidation, or whether lamotrigine is added in the absence of valproate or an inducer of lamotrigine glucuronidation.

In patients already taking maintenance doses of lamotrigine and not taking glucuronidation inducers, the lamotrigine dose may need to be increased if atazanavir/ritonavir is added, or decreased if atazanavir/ritonavir is discontinued.

### ***Elderly (over 65 years of age)***

No dosage adjustment from recommended schedule is required. The pharmacokinetics of lamotrigine in this age group do not differ significantly from a non-elderly adult population.

### ***Hepatic impairment***

Initial, escalation and maintenance doses should generally be reduced by approximately 50% in patients with moderate (Child-Pugh grade B) and 75% in severe (Child-Pugh grade C) hepatic impairment. Escalation and maintenance doses should be adjusted according to clinical response (see section 5.2).

### ***Renal impairment***

Caution should be exercised when administering lamotrigine to patients with renal failure. For patients with end-stage renal failure, initial doses of lamotrigine should be based on patients' AEM regimen; reduced maintenance doses may be effective for patients with significant renal functional impairment (see section 4.4). For more detailed pharmacokinetic information see section 5.2.

### **Method of administration**

LOGEM chewable/dispersible tablets may be chewed, dispersed in a small volume of water (at least enough to cover the whole tablet) or swallowed whole with a little water.

### **4.3 Contraindications**

LOGEM is contraindicated in individuals with known hypersensitivity to lamotrigine or any of the excipients contained in the tablets (see section 6.1).

### **4.4 Special warnings and precautions for use**

**A clinically significant worsening of seizure frequency instead of an improvement may be observed in patients with more than one seizure type, the observed benefit of control for one seizure type should be weighed against any observed worsening in another seizure type.**

#### **Skin rash**

There have been reports of adverse skin reactions, which have generally occurred within the first 8 weeks after initiation of lamotrigine treatment. The majority of rashes are mild and self-limiting; however serious rashes requiring hospitalisation and discontinuation of lamotrigine have also been reported. These have included potentially life-threatening rashes such as Stevens-Johnson syndrome (SJS) and toxic epidermal necrolysis (TEN) (see section 4.8).

In adults enrolled in studies utilising the current lamotrigine dosing recommendations the incidence of serious skin rashes is approximately 1 in 500 in epilepsy patients. Approximately half of these cases have been reported as SJS (1 in 1000).

In clinical trials in patients with bipolar disorder, the incidence of serious rash is approximately 1 in 1000.

The risk of serious skin rashes in children is higher than in adults. Available data from a number of studies suggest the incidence of rashes associated with hospitalisation in children is from 1 in 300 to 1 in 100. In children, the initial presentation of a rash can be mistaken for an infection. Physicians should consider the possibility of a medicine reaction in children that develop symptoms of rash and fever during the first eight weeks of therapy.

Additionally, the overall risk of rash appears to be strongly associated with:

- High initial doses of lamotrigine and exceeding the recommended dose escalation of lamotrigine therapy (see section 4.2).
- Concomitant use of valproate (see section 4.2).

Caution is also required when treating patients with a history of allergy or rash to other anti-epileptic medicines as the frequency of non-serious rash after treatment with lamotrigine was approximately three times higher in these patients than in those without such history.

All patients (adults and children) who develop a rash should be promptly evaluated and lamotrigine withdrawn immediately unless the rash is clearly not medicine related. It is recommended that lamotrigine not be restarted in patients who have discontinued due to rash associated with prior treatment with lamotrigine unless the potential benefit clearly outweighs the risk.

Rash has also been reported as part of Drug Reaction with Eosinophilia and Systemic Symptoms (DRESS); also known as hypersensitivity syndrome. This condition is associated with a variable pattern of systemic symptoms including fever, lymphadenopathy, facial oedema, abnormalities of the blood, liver and kidney and aseptic meningitis (see section 4.8). The syndrome shows a wide spectrum of clinical severity and may, rarely, lead to disseminated intravascular coagulation (DIC) and multi-organ failure. It is important to note that early manifestations of hypersensitivity (e.g. fever, lymphadenopathy) may be present even though rash is not evident. If such signs and symptoms are present the patient should be evaluated immediately and lamotrigine discontinued if an alternative aetiology cannot be established.

### **Aseptic meningitis**

Post-marketing cases of aseptic meningitis have been reported in paediatric and adult patients taking lamotrigine for various indications. Aseptic meningitis was reversible on withdrawal of the medicine in most cases, but recurred in a number of cases on re-exposure to lamotrigine. Re-exposure resulted in a rapid return of symptoms that were frequently more severe. Lamotrigine should not be restarted in patients who have discontinued due to aseptic meningitis associated with prior treatment of lamotrigine.

### **Haemophagocytic lymphohistiocytosis (HLH)**

HLH has occurred in patients taking lamotrigine (see section 4.8). HLH is a syndrome of pathological immune activation, which can be life threatening, characterised by clinical signs and symptoms such as fever, rash, neurological symptoms, hepatosplenomegaly, lymphadenopathy, cytopenias, high serum ferritin, hypertriglyceridaemia and abnormalities of liver function and coagulation. Symptoms occur generally within 4 weeks of treatment initiation.

Immediately evaluate patients who develop these signs and symptoms and consider a diagnosis of HLH. Lamotrigine should be discontinued unless an alternative aetiology can be established.

### **Suicide risk**

Symptoms of depression and/or bipolar disorder may occur in patients with epilepsy, and there is evidence that patients with epilepsy and bipolar disorder have an elevated risk for suicidality.

Twenty-five to 50% of patients with bipolar disorder attempt suicide at least once, and may experience worsening of their depressive symptoms and/or the emergence of suicidal ideation and behaviours (suicidality) whether or not they are taking medications for bipolar disorder, including lamotrigine.

Suicidal ideation and behaviour have been reported in patients treated with AEMs in several indications, including epilepsy and bipolar disorder. A meta-analysis of randomised placebo-controlled trials of AEMs (including lamotrigine) has also shown a small increased risk of suicidal ideation and behaviour. The mechanism of this risk is not known and the available data do not exclude the possibility of an increased risk for lamotrigine.

Therefore patients should be monitored for signs of suicidal ideation and behaviours. Patients (and caregivers of patients) should be advised to seek medical advice should signs of suicidal ideation or behaviour emerge.

### **Clinical worsening in bipolar disorder**

Patients receiving lamotrigine for bipolar disorder should be closely monitored for clinical worsening (including development of new symptoms) and suicidality, especially at the beginning of a course of treatment, or at the time of dose changes. Certain patients, such as those with a

history of suicidal behaviour or thoughts, young adults, and those patients exhibiting a significant degree of suicidal ideation prior to commencement of treatment, may be at a greater risk of suicidal thoughts or suicide attempts, and should receive careful monitoring during treatment.

Patients (and caregivers of patients) should be alerted about the need to monitor for any worsening of their condition (including development of new symptoms) and/or the emergence of suicidal ideation/behaviour or thoughts of harming themselves and to seek medical advice immediately if these symptoms present.

Consideration should be given to changing the therapeutic regimen, including possibly discontinuing the medication, in patients who experience clinical worsening (including development of new symptoms) and/or the emergence of suicidal ideation/behaviour, especially if these symptoms are severe, abrupt in onset, or were not part of the patient's presenting symptoms.

## **Hormonal contraceptives**

### ***Effects of hormonal contraceptives on lamotrigine efficacy***

An ethinylestradiol/levonorgestrel (30 micrograms / 150 micrograms) combination has been demonstrated to increase the clearance of lamotrigine by approximately two-fold resulting in decreased lamotrigine levels (see section 4.5). Following titration, higher maintenance doses of lamotrigine (by as much as two-fold) will be needed in most cases to attain a maximal therapeutic response. In women not already taking an inducer of lamotrigine glucuronidation and taking a hormonal contraceptive that includes one week of inactive medication (e.g. "pill-free week"), gradual transient increases in lamotrigine levels will occur during the week of inactive medication. These increases will be greater when lamotrigine dose increases are made in the days before or during the week of inactive medication. For dosing instructions see section 4.2 – Special populations: Women taking hormonal contraceptives.

Clinicians should exercise appropriate clinical management of women starting or stopping hormonal contraceptives during lamotrigine therapy and lamotrigine dosing adjustments will be needed in most cases.

Other oral contraceptive and hormone replacement therapy (HRT) treatments have not been studied, though they may similarly affect lamotrigine pharmacokinetic parameters (see section 4.2 Special populations (for dosing instructions for women taking hormonal contraceptives) and section 4.4).

### ***Effects of lamotrigine on hormonal contraceptive efficacy***

An interaction study in 16 healthy volunteers has shown that when lamotrigine and a hormonal contraceptive (ethinylestradiol/levonorgestrel combination) are administered in combination, there is a modest increase in levonorgestrel clearance and changes in serum FSH and LH (see section 4.5). The impact of these changes on ovarian ovulatory activity is unknown. However, the possibility of these changes resulting in decreased contraceptive efficacy in some patients taking hormonal preparations with lamotrigine cannot be excluded. Therefore patients should be instructed to promptly report changes in their menstrual pattern, i.e. breakthrough bleeding.

## **Effect of lamotrigine on organic cationic transporter 2 (OCT 2) substrates**

Lamotrigine is an inhibitor of renal tubular secretion via OCT 2 proteins (see section 4.5). This may result in increased plasma levels of certain medicines that are substantially excreted via this route. Co-administration of lamotrigine with OCT 2 substrates with a narrow therapeutic index e.g. dofetilide is not recommended.

## **Dihydrofolate reductase**

Lamotrigine is a weak inhibitor of dihydrofolate reductase, hence there is a possibility of interference with folate metabolism during long-term therapy. However, during prolonged human dosing, lamotrigine did not induce significant changes in the haemoglobin concentration, mean

corpuscular volume, or serum or red blood cell folate concentrations up to 1 year or red blood cell folate concentrations for up to 5 years.

### **Renal failure**

In single dose studies in subjects with end-stage renal failure, plasma concentrations of lamotrigine were not significantly altered. However, accumulation of the glucuronide metabolite is to be expected; caution should therefore be exercised in treating patients with renal failure.

### **Patients taking other preparations containing lamotrigine**

LOGEM should not be administered to patients currently being treated with any other preparation containing lamotrigine without consulting a doctor.

### **Brugada-type ECG**

A very rare association with Brugada-type ECG has been observed, although a causal relationship has not been established. Therefore, careful consideration should be given before using lamotrigine in patients with Brugada syndrome.

### **Epilepsy**

As with other AEMs, abrupt withdrawal of lamotrigine may provoke rebound seizures. Unless safety concerns (for example rash) require an abrupt withdrawal, the dose of lamotrigine should be gradually decreased over a period of 2 weeks.

There are reports in the literature that severe convulsive seizures including status epilepticus may lead to rhabdomyolysis, multi-organ dysfunction and disseminated intravascular coagulation, sometimes with fatal outcome. Similar cases have occurred in association with the use of lamotrigine.

### **Bipolar Disorder**

#### ***Children and adolescents (less than 18 years of age)***

Treatment with antidepressants is associated with an increased risk of suicidal thinking and behaviour in children and adolescents with major depressive disorder and other psychiatric disorders.

### **Interference with laboratory tests**

Lamotrigine has been reported to interfere with the assay used in some rapid urine drug screens, which can result in false positive readings, particularly for phencyclidine (PCP). A more specific alternative chemical method should be used to confirm a positive result.

## **4.5 Interaction with other medicines and other forms of interaction**

Uridine 5'-diphospho (UDP)-glucuronyl transferases (UGTs) have been identified as the enzymes responsible for metabolism of lamotrigine. Medicines that induce or inhibit glucuronidation may, therefore, affect the apparent clearance of lamotrigine. Strong or moderate inducers of the cytochrome P450 3A4 (CYP3A4) enzyme, which are also known to induce UGTs, may also enhance the metabolism of lamotrigine.

Those medicines that have been demonstrated to have a clinically significant impact on lamotrigine metabolism are outlined in the table below. Specific dosing guidance for these medicines is provided in section 4.2.

There is no evidence that lamotrigine causes clinically significant induction or inhibition of cytochrome P450 enzymes. Lamotrigine may induce its own metabolism but the effect is modest and unlikely to have significant clinical consequences.

**Table 6: Table of effects of other medicines on glucuronidation of lamotrigine (see section 4.2)**

<b>Medicines that significantly inhibit glucuronidation of lamotrigine</b>	<b>Medicines that significantly induce glucuronidation of lamotrigine</b>	<b>Medicines that do not significantly inhibit or induce glucuronidation of lamotrigine</b>
Valproate	Carbamazepine Phenytoin Primidone Phenobarbitone Rifampicin Lopinavir/ritonavir Atazanavir/ritonavir* Ethinylestradiol/levonorgestrel combination**	Lithium Bupropion Olanzapine Oxcarbazepine Felbamate Gabapentin Levetiracetam Pregabalin Topiramate Zonisamide Aripiprazole Lacosamide Perampanel

\* For dosing guidance see section 4.2 Special populations.

\*\* Other oral contraceptive and HRT treatments have not been studied, though they may similarly affect lamotrigine pharmacokinetic parameters; see section 4.2 – special populations (for dosing instructions for women taking hormonal contraceptives) and section 4.4 – Hormonal contraceptives.

### **Interactions involving AEMs**

(see section 4.2).

Valproate, which inhibits the glucuronidation of lamotrigine, reduces the metabolism of lamotrigine and increases the mean half-life of lamotrigine nearly two-fold.

Certain AEMs (such as phenytoin, carbamazepine, phenobarbitone and primidone) which induce cytochrome P450 enzymes also induce UGTs and, therefore, enhance the metabolism of lamotrigine.

There have been reports of central nervous system events including dizziness, ataxia, diplopia, blurred vision and nausea in patients taking carbamazepine following the introduction of lamotrigine. These events usually resolve when the dose of carbamazepine is reduced. A similar effect was seen during a study of lamotrigine IR and oxcarbazepine in healthy adult volunteers, but dose reduction was not investigated.

In a study in healthy adult volunteers using doses of 200 mg lamotrigine and 1200 mg oxcarbazepine, oxcarbazepine did not alter the metabolism of lamotrigine and lamotrigine did not alter the metabolism of oxcarbazepine.

In a study of healthy volunteers, co-administration of felbamate (1200 mg twice daily) with lamotrigine (100 mg twice daily for 10 days) appeared to have no clinically relevant effects on the pharmacokinetics of lamotrigine.

Based on a retrospective analysis of plasma levels in patients who received lamotrigine both with and without gabapentin, gabapentin does not appear to change the apparent clearance of lamotrigine.

Potential medicine interactions between levetiracetam and lamotrigine were assessed by evaluating serum concentrations of both agents during placebo-controlled clinical trials. These data indicate that lamotrigine does not influence the pharmacokinetics of levetiracetam and that levetiracetam does not influence the pharmacokinetics of lamotrigine.

Steady-state trough plasma concentrations of lamotrigine were not affected by concomitant pregabalin (200 mg three times daily) administration. There are no pharmacokinetic interactions between lamotrigine and pregabalin.

Topiramate resulted in no change in plasma concentrations of lamotrigine. Administration of lamotrigine resulted in a 15% increase in topiramate concentrations.

In a study of patients with epilepsy, co-administration of zonisamide (200 to 400 mg/day) with lamotrigine (150 to 500 mg/day) for 35 days had no significant effect on the pharmacokinetics of lamotrigine.

Plasma concentrations of lamotrigine were not affected by concomitant lacosamide (200 or 400 mg/day) in placebo-controlled clinical trials in patients with partial-onset seizures.

In a pooled analysis of data from three placebo-controlled clinical trials investigating adjunctive perampanel in patients with partial-onset and primary generalised tonic-clonic seizures, the highest perampanel dose evaluated (12 mg/day) increased lamotrigine clearance by less than 10%. An effect of this magnitude is not considered to be clinically relevant.

Although changes in the plasma concentrations of other anti-epileptic medicines have been reported, controlled studies have shown no evidence that lamotrigine affects the plasma concentrations of concomitant anti-epileptic medicines. Evidence from *in vitro* studies indicates that lamotrigine does not displace other anti-epileptic medicines from protein binding sites.

## **Interactions involving other psychoactive agents**

(see section 4.2).

The pharmacokinetics of lithium after 2 g of anhydrous lithium gluconate given twice daily for six days to 20 healthy subjects were not altered by co-administration of 100 mg/day lamotrigine.

Multiple oral doses of bupropion had no statistically significant effects on the single dose pharmacokinetics of lamotrigine in 12 subjects and had only a slight increase in the AUC of lamotrigine glucuronide.

In a study in healthy adult volunteers, 15 mg olanzapine reduced the AUC and  $C_{max}$  of lamotrigine by an average of 24% and 20%, respectively. An effect of this magnitude is not generally expected to be clinically relevant. Lamotrigine at 200 mg did not affect the pharmacokinetics of olanzapine.

Multiple oral doses of lamotrigine 400 mg daily had no clinically significant effect on the single dose pharmacokinetics of 2 mg risperidone in 14 healthy adult volunteers. Following the co-administration of risperidone 2 mg with lamotrigine, 12 out of the 14 volunteers reported somnolence compared to 1 out of 20 when risperidone was given alone, and none when lamotrigine was administered alone.

In a study of 18 adult patients with bipolar I disorder, receiving an established regimen of lamotrigine ( $\geq 100$  mg/day), doses of aripiprazole were increased from 10 mg/day to a target of 30 mg/day over a 7-day period and continued once daily for a further 7 days. An average reduction of approximately 10% in  $C_{max}$  and AUC of lamotrigine was observed. An effect of this magnitude is not expected to be of clinical consequence.

*In vitro* inhibition experiments indicated that the formation of lamotrigine's primary metabolite, the 2-N-glucuronide, was minimally affected by co-incubation with amitriptyline, bupropion, clonazepam, fluoxetine, haloperidol, or lorazepam. Bufuralol metabolism data from human liver

microsome suggested that lamotrigine does not reduce the clearance of medicines eliminated predominantly by CYP2D6. Results of *in vitro* experiments also suggest that clearance of lamotrigine is unlikely to be affected by clozapine, phenelzine, risperidone, sertraline or trazodone.

## **Interactions involving hormonal contraceptives**

### ***Effect of hormonal contraceptives on lamotrigine pharmacokinetics***

In a study of 16 female volunteers, 30 micrograms ethinylestradiol/150 micrograms levonorgestrel in a combined oral contraceptive pill caused an approximately two-fold increase in lamotrigine oral clearance, resulting in an average 52% and 39% reduction in lamotrigine AUC and  $C_{max}$ , respectively. Serum lamotrigine concentrations gradually increased during the course of the week of inactive medication (e.g. "pill-free" week), with pre-dose concentrations at the end of the week of inactive medication being, on average, approximately two-fold higher than during co-therapy (see section 4.2 – Special populations (for dosing instructions for women taking hormonal contraceptives) and section 4.4 – Hormonal contraceptives).

### ***Effect of lamotrigine on hormonal contraceptive pharmacokinetics***

In a study of 16 female volunteers, a steady state dose of 300 mg lamotrigine had no effect on the pharmacokinetics of the ethinylestradiol component of a combined oral contraceptive pill. A modest increase in oral clearance of the levonorgestrel component was observed, resulting in an average 19% and 12% reduction in levonorgestrel AUC and  $C_{max}$ , respectively. Measurement of serum FSH, LH and estradiol during the study indicated some loss of suppression of ovarian hormonal activity in some women, although measurement of serum progesterone indicated that there was no hormonal evidence of ovulation in any of the 16 subjects. The impact of the modest increase in levonorgestrel clearance and the changes in serum FSH and LH, on ovarian ovulatory activity is unknown (see section 4.4). The effects of doses of lamotrigine other than 300 mg/day have not been studied and studies with other female hormonal preparations have not been conducted.

## **Interactions involving other medications**

In a study in 10 male volunteers, rifampicin increased lamotrigine clearance and decreased lamotrigine half-life due to induction of the hepatic enzymes responsible for glucuronidation. In patients receiving concomitant therapy with rifampicin, the treatment regimen recommended for lamotrigine and concurrent glucuronidation inducers should be used (see section 4.2).

In a study in healthy volunteers, lopinavir/ritonavir approximately halved the plasma concentrations of lamotrigine, probably by induction of glucuronidation. In patients receiving concomitant therapy with lopinavir/ritonavir, the treatment regimen recommended for lamotrigine and concurrent glucuronidation inducers should be used (see section 4.2).

In a study in healthy adult volunteers, atazanavir/ritonavir (300 mg/100 mg) reduced the plasma AUC and  $C_{max}$  of lamotrigine (single 100 mg dose) by an average of 32% and 6%, respectively (see section 4.2 – Special populations).

Data from *in vitro* assessment of the effect of lamotrigine at OCT 2 demonstrate that lamotrigine, but not the N(2)-glucuronide metabolite, is an inhibitor of OCT 2 at potentially clinically relevant concentrations. These data demonstrate that lamotrigine is an inhibitor of OCT 2, with  $IC_{50}$  value of 53.8  $\mu$ M (see section 4.4).

## **4.6 Fertility, pregnancy and lactation**

### **Pregnancy**

Lamotrigine should not be used in pregnancy unless, in the opinion of the physician, the potential benefits of treatment to the mother outweigh any possible risks to the developing foetus.

Post-marketing data from several prospective pregnancy registries have documented outcomes in over 8,700 women exposed to lamotrigine monotherapy during the first trimester of pregnancy. Overall, these data do not suggest a substantial increase in the risk for major congenital



malformations. Although data from a limited number of registries have reported an increase in the risk of isolated oral cleft malformations, a completed case control study did not demonstrate an increased risk of oral clefts compared to other major congenital malformations following exposure to lamotrigine.

The data on use of lamotrigine in polytherapy combinations are insufficient to assess whether the risk of malformation associated with other agents is affected by concomitant lamotrigine use.

Physiological changes during pregnancy may affect lamotrigine levels and/or therapeutic effect. There have been reports of decreased lamotrigine levels during pregnancy. Appropriate clinical management of pregnant women during lamotrigine therapy should be ensured.

### **Breast-feeding**

Lamotrigine has been reported to pass into breast milk in highly variable concentrations, resulting in total lamotrigine levels in infants of up to approximately 50% of the mother's. Therefore, in some breast-fed infants, serum concentrations of lamotrigine may reach levels at which pharmacological effects occur.

The potential benefits of breast feeding should be weighed against the potential risk of adverse effects occurring in the infant.

### **Fertility**

Administration of lamotrigine did not impair fertility in animal reproductive studies.

There is no experience of the effect of lamotrigine on human fertility.

## **4.7 Effects on ability to drive and use machines**

Two volunteer studies have demonstrated that the effect of lamotrigine on fine visual motor co-ordination, eye movements, body sway and subjective sedative effects did not differ from placebo. In clinical trials with lamotrigine adverse events of a neurological character such as dizziness and diplopia have been reported. Therefore, patients should see how lamotrigine therapy affects them before driving or operating machinery.

### **Epilepsy**

As there is individual variation in response to all anti-epileptic medicine therapy patients should consult their physician on the specific issues of driving and epilepsy.

## **4.8 Undesirable effects**

The adverse reactions identified from epilepsy or bipolar disorder clinical trial data have been divided into indication specific sections. Additional adverse reactions identified through post-marketing surveillance for both indications are included in the post-marketing section. All three sections should be consulted when considering the overall safety profile of lamotrigine.

The following convention has been utilised for the classification of undesirable effects: Very common ( $\geq 1/10$ ), common ( $\geq 1/100$  to  $< 1/10$ ), uncommon ( $\geq 1/1000$  to  $< 1/100$ ), rare ( $\geq 1/10,000$  to  $< 1/1000$ ), very rare ( $< 1/10,000$ ).

### **Epilepsy**

The following adverse reactions were identified during epilepsy clinical trials and should be considered alongside those seen in the bipolar disorder clinical trials and post-marketing sections for an overall safety profile of lamotrigine.

#### ***Skin and subcutaneous tissue disorders***

Very common: Skin rash  
Rare: Stevens-Johnson Syndrome (SJS)  
Very rare: Toxic epidermal necrolysis (TEN)

In double-blind, add-on clinical trials in adults, skin rashes occurred in up to 10% of patients taking lamotrigine and in 5% of patients taking placebo. The skin rashes led to the withdrawal of lamotrigine treatment in 2% of patients. The rash, usually maculopapular in appearance, generally appears within 8 weeks of starting treatment and resolves on withdrawal of lamotrigine (see section 4.4).

Rarely, serious potentially life-threatening skin rashes, including Stevens-Johnson syndrome and toxic epidermal necrolysis (Lyell's Syndrome) have been reported. Although the majority recover on medicine withdrawal, some patients experience irreversible scarring and there have been rare cases of associated death (see section 4.4).

The overall risk of rash appears to be strongly associated with:

- High initial doses of lamotrigine and exceeding the recommended dose escalation of lamotrigine therapy (see section 4.2).
- Concomitant use of valproate (see section 4.2).

Rash has also been reported as part of Drug Reaction with Eosinophilia and Systemic Symptoms (DRESS); also known as hypersensitivity syndrome. This condition is associated with a variable pattern of systemic symptoms (see section 4.4 and Immune system disorders below\*\*).

### ***Blood and lymphatic system disorders***

Very rare: Haematological abnormalities (including neutropenia, leucopenia, anaemia, thrombocytopenia, pancytopenia, aplastic anaemia, agranulocytosis), lymphadenopathy

Haematological abnormalities and lymphadenopathy may or may not be associated with DRESS/hypersensitivity syndrome (see section 4.4 and Immune system disorders below\*\*).

### ***Immune system disorders***

Very rare: DRESS/hypersensitivity syndrome\*\* including such symptoms as fever, lymphadenopathy, facial oedema, abnormalities of the blood, liver and kidney

\*\* Rash has also been reported as part of this syndrome which shows a wide spectrum of clinical severity and may, rarely, lead to disseminated intravascular coagulation (DIC) and multi-organ failure. It is important to note that early manifestations of hypersensitivity (e.g. fever, lymphadenopathy) may be present even though rash is not evident. If such signs and symptoms are present, the patient should be evaluated immediately and lamotrigine discontinued if an alternative aetiology cannot be established.

### ***Psychiatric disorders***

Common: Aggression, irritability  
Very rare: Tics, hallucinations, confusion

Anti-epileptic medicines have been associated with an increased risk of suicidal behaviour, suicidal ideation and emergence or worsening of existing depression.

### ***Nervous system disorders***

Very common: Headache  
Common: Somnolence, insomnia, dizziness, tremor  
Rare: Ataxia  
Very rare: Nystagmus

### ***Eye disorders***

Uncommon: Diplopia, blurred vision

### ***Gastrointestinal disorders***

Very common: Nausea, vomiting, diarrhoea

### ***Hepatobiliary disorders***

Very rare: Increased liver function tests, hepatic dysfunction, hepatic failure

Hepatic dysfunction usually occurs in association with hypersensitivity reactions, but isolated cases have been reported without overt signs of hypersensitivity.

### ***Musculoskeletal and connective tissue disorders***

Very rare: Lupus-like reactions

### ***General disorders and administration site conditions***

Common: Tiredness

### **Bipolar disorder**

The following adverse reactions were identified during bipolar disorder clinical trials and should be considered alongside those seen in the epilepsy clinical trials and post-marketing sections for an overall safety profile of lamotrigine.

### ***Skin and subcutaneous tissue disorders***

Very Common: Skin rash

Rare: Stevens-Johnson Syndrome (SJS)

When all bipolar disorder studies (controlled and uncontrolled) conducted with lamotrigine are considered, skin rashes occurred in 12% of patients on lamotrigine. Whereas, in controlled clinical trials with bipolar disorder patients, skin rashes occurred in 8% of patients taking lamotrigine and in 6% of patients taking placebo.

### ***Nervous system disorders***

Very Common: Headache

Common: Agitation, somnolence, dizziness

### ***Musculoskeletal and connective tissue disorders***

Common: Arthralgia

### ***General disorders and administration site conditions***

Common: Pain, back pain

### **Post-marketing**

This section includes adverse reactions identified through post-marketing surveillance for both indications. These adverse reactions should be considered alongside those seen in the epilepsy and bipolar disorder clinical trials sections for an overall safety profile of lamotrigine.

### ***Blood and lymphatic system disorders***

Very rare: Haemophagocytic lymphohistiocytosis (see section 4.4)

### ***Immune system disorders***

Very rare: Hypogammaglobulinaemia

### ***Skin and subcutaneous tissue disorders***

Rare: Alopecia

### ***Psychiatric disorders***

Very rare: Nightmares

### ***Nervous system disorders***

Very common: Somnolence, ataxia, headache, dizziness

Common: Nystagmus, tremor, insomnia

Rare: Aseptic meningitis (see section 4.4), agitation, unsteadiness, movement disorders, worsening of Parkinson's disease, extrapyramidal effects, choreoathetosis, increase in seizure frequency

There have been reports that lamotrigine may worsen parkinsonian symptoms in patients with pre-existing Parkinson's disease, and isolated reports of extrapyramidal effects and choreoathetosis in patients without this underlying condition.

### ***Eye disorders***

Rare: Conjunctivitis

### ***Renal and urinary disorders***

Very rare: Tubulointerstitial nephritis\*

\*may occur in association with uveitis

### **Reporting of suspected adverse reactions**

Reporting suspected adverse reactions after authorisation of the medicine is important. It allows continued monitoring of the benefit/risk balance of the medicine. Healthcare professionals are asked to report any suspected adverse reactions <https://nzphvc.otago.ac.nz/reporting/>.

## **4.9 Overdose**

### **Symptoms and signs**

Acute ingestion of doses in excess of 10 – 20 times the maximum therapeutic dose of lamotrigine have been reported, including fatal cases. Overdose has resulted in symptoms including nystagmus, ataxia, impaired consciousness, grand mal convulsion and coma. QRS broadening (intraventricular conduction delay) has also been observed in overdose patients.

### **Treatment**

In the event of overdosage, the patient should be admitted to hospital and given appropriate supportive therapy as clinically indicated or as recommended by the National Poisons Information Centre, where available.

For further advice on management of overdose please contact the National Poisons Information Centre (0800 POISON or 0800 764 766).

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## **5. Pharmacological Properties**

### ***5.1 Pharmacodynamic properties***

Pharmacotherapeutic group: Antiepileptics, ATC code: N03AX09

### **Mechanism of action**

The results of pharmacological studies suggest that lamotrigine is a use-dependent blocker of voltage-gated sodium channels. It produces a use- and voltage-dependent block of sustained repetitive firing in cultured neurones and inhibits pathological release of glutamate (the amino acid which plays a key role in the generation of epileptic seizures), as well as inhibiting glutamate-evoked bursts of action potentials.

### **Pharmacodynamic effects**

In tests designed to evaluate the central nervous system effects of medicines, the results obtained using doses of 240 mg lamotrigine administered to healthy volunteers did not differ from placebo, whereas both 1000 mg phenytoin and 10 mg diazepam each significantly impaired fine visual motor coordination and eye movements, increased body sway and produced subjective sedative effects.

In another study, single oral doses of 600 mg carbamazepine significantly impaired fine visual motor co-ordination and eye movements, while increasing both body sway and heart rate, whereas results with lamotrigine at doses of 150 mg and 300 mg did not differ from placebo.

### **Clinical efficacy and safety**

#### ***Adjunctive therapy in patients aged 1-24 months with partial seizures***

The effectiveness of lamotrigine as adjunctive therapy in patients aged 1 to 24 months with partial seizures was evaluated in a multi-centre, double-blind, placebo-controlled add-on trial (Study LAM20006). Lamotrigine was added to 1 or 2 AEMs during an open-label phase (n=177).

Lamotrigine was given on alternate days or once daily if an initial total dose or dose-titration step of less than 2 mg was required. Serum levels were measured at the end of week 2 of titration and the subsequent dose either reduced or not increased if the concentration exceeded 0.41 µg/mL, the expected concentration in adults at this time point. Dose reductions of up to 90% were required in some patients at the end of week 2. If valproate was used as an AEM, lamotrigine was added only after an infant had been on valproate for 6 months without liver function test abnormalities. The safety and efficacy of lamotrigine in patients weighing less than 6.7 kg, and taking valproate or AEMs other than carbamazepine, phenytoin, phenobarbital, or primidone has not been evaluated.

Patients achieving a 40% or greater reduction in partial seizure frequency (n=38) were randomised to either gradual withdrawal to placebo (n=19) or continued lamotrigine (n=19) for up to 8 weeks. The primary efficacy endpoint was based on the difference in the proportion of subjects receiving lamotrigine or placebo who met defined escape criteria. The escape criteria allowed the withdrawal of subjects from the study if their epilepsy conditions showed any signs of clinical deterioration. Statistical significance on the primary endpoint was not achieved; however, fewer patients met escape criteria on lamotrigine (58%) compared with placebo (84%) and took a longer time to meet escape criteria (42 versus 22 days).

The adverse event profile was similar to that seen in older children.

#### ***Prevention of depressive episodes in patients with bipolar disorder***

Two pivotal studies have demonstrated efficacy in the prevention of depressive episodes in patients with bipolar I disorder.

Clinical study SCAB20003 was a multi-centre, double-blind, double-dummy, placebo and lithium-controlled, randomised fixed dose evaluation of the long term prevention of relapse and recurrence of depression and/or mania in patients with bipolar I disorder who had recently or were currently experiencing a major depressive episode. Once stabilised using lamotrigine monotherapy or lamotrigine plus psychotropic medication, patients were randomly assigned into one of five treatment groups: lamotrigine (50, 200, 400 mg/day), lithium (serum levels of 0.8 to 1.1 mEq/L) or placebo for a maximum of 76 weeks (18 months). Treatment regimens were maintained until an emerging mood episode (depressive or manic) deemed it necessary to intervene with additional pharmacotherapy or electroconvulsive therapy (ECT).

The primary endpoint was “Time to Intervention for a Mood Episode (TIME),” where the interventions were either additional pharmacotherapy or ECT. This endpoint was analysed using three methods of handling data from patients who were withdrawn prior to having an intervention. The p-values for these analyses ranged from 0.003 to 0.029. In supportive analyses of time to first depressive episode and time to first manic/hypomanic or mixed episode, the lamotrigine patients had longer times to first depressive episode than placebo patients (p=0.047), and the treatment difference with respect to time to manic/hypomanic or mixed episodes was not statistically significant.

Clinical study SCAB2006 was a multi-centre, double-blind, double dummy, placebo and lithium-controlled, randomised, flexible dose evaluation of lamotrigine in the long-term prevention of relapse and recurrence of manic and/or depression in patients with bipolar I disorder who had recently or were currently experiencing a manic or hypomanic episode. Once stabilised using lamotrigine monotherapy or lamotrigine plus psychotropic medication, patients were randomly assigned into one of three treatment groups: lamotrigine (100 to 400 mg/day), lithium (serum levels of 0.8 to 1.1 mEq/L) or placebo for a maximum of 76 weeks (18 months). Treatment regimens were maintained until an emerging mood episode (depressive or manic) deemed it necessary to intervene with additional pharmacotherapy or electroconvulsive therapy (ECT).

The primary endpoint was “Time to Intervention for a Mood Episode (TIME),” where the interventions were either additional pharmacotherapy or ECT. This endpoint was analysed using three methods of handling data from patients who were withdrawn prior to having an intervention. The p-values for these analyses ranged from 0.003 to 0.023. In supportive analyses of time to first depressive episode and time to first manic/hypomanic or mixed episode, the lamotrigine patients had longer times to first depressive episode than placebo patients (p=0.015), and the treatment difference with respect to time to manic/hypomanic or mixed episodes was not statistically significant.

In clinical trials, propensity to induce destabilisation, mania or hypomania whilst on lamotrigine therapy was not significantly different to placebo.

## **5.2 Pharmacokinetic properties**

### **Absorption**

Lamotrigine is rapidly and completely absorbed from the gut with no significant first pass metabolism. Peak plasma concentrations occur approximately 2.5 hours after oral administration. Time to maximum concentration is slightly delayed after food but the extent of absorption is unaffected. The pharmacokinetics are linear up to 450 mg, the highest single dose tested. There is considerable inter-individual variation in steady state maximum concentrations but within an individual, concentrations rarely vary.

### **Distribution**

Binding to plasma proteins is about 55%; it is very unlikely that displacement from plasma proteins would result in toxicity. The volume of distribution is 0.92 to 1.22 L/kg.

### **Biotransformation**

UDP-glucuronyl transferases have been identified as the enzymes responsible for metabolism of lamotrigine.

Lamotrigine induces its own metabolism to a modest extent depending on dose. However, there is no evidence that lamotrigine affects the pharmacokinetics of other AEMs and data suggest that interactions between lamotrigine and medicines metabolised by cytochrome P450 enzymes are unlikely to occur.

### **Elimination**

The mean steady state clearance in healthy adults is  $39 \pm 14$  mL/min. Clearance of lamotrigine is primarily metabolic with subsequent elimination of glucuronide-conjugated material in urine. Less

than 10% is excreted unchanged in the urine. Only about 2% of medicine-related material is excreted in faeces. Clearance and half-life are independent of dose. The mean elimination half-life in healthy adults is 24 to 35 hours. In a study of subjects with Gilbert's Syndrome, mean apparent clearance was reduced by 32% compared with normal controls but the values are within the range for the general population.

The half-life of lamotrigine is greatly affected by concomitant medication.

Mean half-life is reduced to approximately 14 hours when given with glucuronidation-inducing medicines such as carbamazepine and phenytoin and is increased to a mean of approximately 70 hours when co-administered with valproate alone (see section 4.2 and 4.5).

## **Special populations**

### ***Children***

Clearance adjusted for bodyweight is higher in children than in adults with the highest values in children under five years. The half-life of lamotrigine is generally shorter in children than in adults with a mean value of approximately 7 hours when given with enzyme-inducing medicines such as carbamazepine and phenytoin and increasing to mean values of 45 to 50 hours when co-administered with valproate alone (see section 4.2).

### ***Elderly***

Results of a population pharmacokinetic analysis including both young and elderly patients with epilepsy, enrolled in the same trials, indicated that the clearance of lamotrigine did not change to a clinically relevant extent. After single doses apparent clearance decreased by 12% from 35 mL/min at age 20 to 31 mL/min at 70 years. The decrease after 48 weeks of treatment was 10% from 41 to 37 mL/min between the young and elderly groups. In addition, pharmacokinetics of lamotrigine was studied in 12 healthy elderly subjects following a 150 mg single dose. The mean clearance in the elderly (0.39 mL/min/kg) lies within the range of the mean clearance values (0.31 to 0.65 mL/min/kg) obtained in 9 studies with non-elderly adults after single doses of 30 to 450 mg.

### ***Renal impairment***

Twelve volunteers with chronic renal failure, and another 6 individuals undergoing haemodialysis were each given a single 100 mg dose of lamotrigine. Mean CL/F were 0.42 mL/min/kg (chronic renal failure), 0.33 mL/min/kg (between haemodialysis), and 1.57 mL/min/kg (during haemodialysis) compared to 0.58 mL/min/kg in healthy volunteers. Mean plasma half-lives were 42.9 hours (chronic renal failure), 57.4 hours (between haemodialysis) and 13.0 hours (during haemodialysis), compared to 26.2 hours in healthy volunteers. On average, approximately 20% (range = 5.6 to 35.1) of the amount of lamotrigine present in the body was eliminated during a 4 hour haemodialysis session. For this patient population, initial doses of lamotrigine should be based on patients' AEM regimen; reduced maintenance doses may be effective for patients with significant renal functional impairment.

### ***Hepatic impairment***

A single-dose pharmacokinetic study was performed in 24 subjects with various degrees of hepatic impairment and 12 healthy subjects as controls. The median apparent clearance of lamotrigine was 0.31, 0.24 or 0.10 mL/min/kg in patients with Grade A, B, or C (Child-Pugh Classification) hepatic impairment, respectively, compared to 0.34 mL/min/kg in the healthy controls. Initial, escalation, and maintenance doses should generally be reduced by approximately 50% in patients with moderate (Child-Pugh Grade B) and 75% in patients with severe (Child-Pugh Grade C) hepatic impairment. Escalation and maintenance doses should be adjusted according to clinical response.

## **5.3 Preclinical safety data**

### **Mutagenicity**

The results of a wide range of mutagenicity tests indicate that lamotrigine does not present a genetic risk to man.

### **Carcinogenicity**

Lamotrigine was not carcinogenic in long-term studies in the rat and the mouse.

### **Teratogenicity**

Reproductive toxicology studies with lamotrigine in animals at doses in excess of the human therapeutic dosage showed no teratogenic effects. However, as lamotrigine is a weak inhibitor of dihydrofolate reductase, there is a theoretical risk of human foetal malformations when the mother is treated with a folate inhibitor during pregnancy.

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## **6. Pharmaceutical Particulars**

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### **6.1 *List of excipients***

- Microcrystalline cellulose
- mannitol
- sodium starch glycollate
- silicon dioxide
- blackcurrant flavouring 502009
- saccharin sodium
- magnesium stearate
- povidone

This medicine does not contain lactose or gluten.

### **6.2 *Incompatibilities***

Not applicable.

### **6.3 *Shelf life***

PVC/PVdC/Alu blister: 3 years.

PVC/Alu blister: 2 years.

### **6.4 *Special precautions for storage***

Store at or below 25°C.

### **6.5 *Nature and contents of container***

PVC/PVdC/Alu or PVC/Alu blister: Pack size of 14, 28, 30, 56, 100 chewable/dispersible tablets.

Not all strengths and pack types or sizes may be marketed.

### **6.6 *Special precautions for disposal***

Not applicable.

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## **7. Medicines Schedule**

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Prescription Medicine

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## **8. Sponsor Details**

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## 9. Date of First Approval

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28 September 2006

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## 10. Date of Revision of the Text

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8 July 2020

### Summary table of changes

Section	Summary of new information
4.4	Update the wording on hypersensitivity syndrome and inclusion of renal effects as part of DRESS.
4.8	Update the wording on hypersensitivity syndrome and inclusion of the renal effects as part of DRESS. Removal of duplicated information regarding the hypersensitivity syndrome.
4.8	Addition of 'Tubulointerstitial nephritis' as a very rare Renal & Urinary disorder that may occur in association with uveitis.
8	Updated sponsor contact phone number.