

Active Name: Levetiracetam
Version Number: 132
Version Date: 24 07 JuneOctober -20235

1. NAME OF THE MEDICINAL PRODUCT

Keppra, 250 mg, film-coated tablet
Keppra, 750 mg, film-coated tablet
Keppra, 100 mg/ml, oral solution
Keppra, 100 mg/ml, concentrate for solution for infusion

2. QUALITATIVE AND QUANTITATIVE COMPOSITION

Keppra, 250 mg, film-coated tablet
Each film-coated tablet contains 250 mg of levetiracetam.

Keppra, 750 mg, film-coated tablet
Each film-coated tablet contains 750 mg of levetiracetam.

Keppra, 100 mg/ml, oral solution
Each ml contains 100 mg of levetiracetam.

Keppra, 100 mg/ml, concentrate for solution for infusion
Each ml contains 100 mg of levetiracetam.

Excipient with known effect

Levetiracetam, 750 mg, film-coated tablet
Contains FD&C yellow #6 / Sunset yellow FCF aluminium lake (E110)

Levetiracetam 750 mg film-coated tablets contain sunset yellow lake (E110) colouring agent which may cause allergic-type reactions.

For the full list of excipients, see section 6.1.

3. PHARMACEUTICAL FORM

Keppra, 250 mg, film-coated tablets
Blue, oblong film-coated tablet scored and debossed with the code ucb and 250 on one side.

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The score line is only to facilitate breaking for ease of swallowing and not to divide into equal doses.

Keppra, 750 mg, film-coated tablets

Orange, oblong film-coated tablet scored and debossed with the code ucb and 750 on one side. The score line is only to facilitate breaking for ease of swallowing and not to divide into equal doses.

Keppra, 100 mg/ml, oral solution

A clear liquid.

Keppra, 100 mg/ml, concentrate for solution for infusion

Clear and colourless solution free from visible particulate matter.

4 CLINICAL PARTICULARS

4.1 Therapeutic Indications

Levetiracetam is indicated as monotherapy in the treatment of:

- partial onset seizures with or without secondary generalisation in adults and adolescents from 16 years of age with newly diagnosed epilepsy.

Levetiracetam is indicated as adjunctive therapy in the treatment of:

- partial onset seizures with or without secondary generalisation in adults, adolescents, children and infants from 1 month of age with epilepsy,
- myoclonic seizures in adults and adolescents from 12 years of age with juvenile myoclonic epilepsy,
- primary generalised tonic-clonic seizures in adults and adolescents from 12 years of age with idiopathic generalised epilepsy.

Levetiracetam concentrate is an alternative for patients (adults and children from 4 years of age) when oral administration is temporarily not feasible.

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4.2 Posology and method of administration

Posology

Levetiracetam therapy can be initiated with either intravenous or oral administration. Conversion to or from oral to intravenous administration can be done directly without titration. The total daily dose and frequency of administration should be maintained.

Film-coated tablets

The film-coated tablets must be taken orally, swallowed with a sufficient quantity of liquid and may be taken with or without food. After oral administration the bitter taste of levetiracetam may be experienced. The daily dose is administered in two equally divided doses.

Oral solution

The oral solution may be diluted in a glass of water or baby's bottle and may be taken with or without food. After oral administration the bitter taste of levetiracetam may be experienced. The daily dose is administered in two equally divided doses.

Concentrate for solution for infusion

Levetiracetam concentrate is for intravenous use only and the recommended dose must be diluted in at least 100 ml of a compatible diluent and administered intravenously as a 15-minute intravenous infusion (*see Section Incompatibilities and Use and Handling*).

There is no experience with administration of intravenous levetiracetam for longer period than 4 days.

Levetiracetam concentrate is an alternative for patients (adults and children from 4 years of age) when oral administration is temporarily not feasible.

Route of Administration

For oral use

Levetiracetam, 250 mg, film-coated tablet

Levetiracetam, 750 mg, film-coated tablet

Levetiracetam, 100 mg/ml, oral solution

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For intravenous use

Levetiracetam, 100 mg/ml, concentrate for solution for infusion

Adults

Monotherapy

Adults and adolescents from 16 years of age

The recommended starting dose is 250 mg twice daily which should be increased to an initial therapeutic dose of 500 mg twice daily after two weeks. The dose can be further increased by 250 mg twice daily every two weeks depending upon the clinical response. The maximum dose is 1500 mg twice daily.

Add-on therapy

Adults (≥ 18 years) and adolescents (12 to 17 years) weighing 50 kg or more

The initial therapeutic dose is 500 mg twice daily. This dose can be started on the first day of treatment.

Depending upon the clinical response and tolerability, the daily dose can be increased up to 1,500 mg twice daily. Dose changes can be made in 500 mg twice daily increases or decreases every two to four weeks.

Paediatric population

The physician should prescribe the most appropriate pharmaceutical form, presentation and strength according to age, weight and dose.

The tablet formulation is not adapted for use in infants and children under the age of 6 years.

Levetiracetam oral solution is the preferred formulation for use in this population. In addition, the available dose strengths of the tablets are not appropriate for initial treatment in children weighing less than 25 kg, for patients unable to swallow tablets or for the administration of doses below 250 mg. In all of the above cases levetiracetam oral solution should be used.

The safety and efficacy of levetiracetam concentrate for solution for infusion in infants and children less than 4 years have not been established.

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Monotherapy

The safety and efficacy of levetiracetam in children and adolescents below 16 years as monotherapy treatment have not been established.

There are no data available.

Add-on therapy

Add-on therapy for infants aged from 6 to 23 months, children (2 to 11 years) and adolescents (12 to 17 years) weighing less than 50 kg

Levetiracetam oral solution is the preferred formulation for use in infants and children under the age of 6 years.

For children 6 years and above, levetiracetam oral solution should be used for doses under 250 mg, for doses not multiple of 250 mg when dosing recommendation is not achievable by taking multiple tablets and for patients unable to swallow tablets.

The initial therapeutic dose is 10 mg/kg twice daily.

Depending upon the clinical response and tolerability, the dose can be increased up to 30 mg/kg twice daily. Dose changes should not exceed increases or decreases of 10 mg/kg twice daily every two weeks. The lowest effective dose should be used.

Dose in children 50 kg or greater is the same as in adults.

Dose recommendations for infants from 6 months of age, children and adolescents:

Weight	Starting dose	Maximum dose
	10 mg/kg twice daily	30 mg/kg twice daily
6 kg ⁽¹⁾	60 mg (0.6 ml) twice daily	180 mg (1.8 ml) twice daily
10 kg ⁽¹⁾	100 mg (1 ml) twice daily	300 mg (3 ml) twice daily
15 kg ⁽¹⁾	150 mg (1.5 ml) twice daily	450 mg (4.5 ml) twice daily
20 kg ⁽¹⁾	200 mg (2 ml) twice daily	600 mg (6 ml) twice daily

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25 kg	250 mg twice daily	750 mg twice daily
From 50 kg ⁽²⁾	500 mg twice daily	1500 mg twice daily

⁽¹⁾ Children 25 kg or less should preferably start the treatment with levetiracetam 100 mg/ml oral solution

⁽²⁾ Dose in children and adolescents 50 kg or more is the same as in adults

Add-on therapy for infants aged from 1 month to less than 6 months

The oral solution is the formulation to use in infants.

The initial therapeutic dose is 7 mg/kg twice daily.

Depending upon the clinical response and tolerability, the dose can be increased up to 21 mg/kg twice daily. Dose changes should not exceed increases or decreases of 7 mg/kg twice daily every two weeks. The lowest effective dose should be used.

Infants should start the treatment with levetiracetam 100 mg/ml oral solution.

Dose recommendations for infants aged from 1 month to less than 6 months

Weight	Starting dose	Maximum dose
	7 mg/kg twice daily	21 mg/kg twice daily
4 kg	28 mg (0.3 ml) twice daily	84 mg (0.85 ml) twice daily
5 kg	35 mg (0.35 ml) twice daily	105 mg (1.05 ml) twice daily
7 kg	49 mg (0.5 ml) twice daily	147 mg (1.5 ml) twice daily

Adequate presentation must be used to ensure the accuracy of the dosing.

Special populations

Elderly

Adjustment of the dose is recommended in elderly patients with compromised renal function.

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Renal impairment

The daily dose must be individualised according to renal function (*see Section Warnings and Precautions*).

For adult patients, refer to the following table and adjust the dose as indicated. To use this dosing table, an estimate of the patient's creatinine clearance (CLcr) in ml/min is needed. The CLcr in ml/min may be estimated from serum creatinine (mg/dl) determination, for adults and adolescents weighing 50 kg or more, using the following formula:

$$\text{CLcr (ml/min)} = \frac{[140 - \text{age (years)}] \times \text{weight (kg)}}{72 \times \text{serum creatinine (mg/dl)}} \quad (\times 0.85 \text{ for women})$$

Then CLcr is adjusted for body surface area (BSA) as follows:

$$\text{CLcr (ml/min/1.73 m}^2\text{)} = \frac{\text{CLcr (ml/min)}}{\text{BSA subject (m}^2\text{)}} \times 1.73$$

Dosing adjustment for adult and adolescent patients weighing more than 50kg with impaired renal function

Group	Creatinine clearance (ml/min/1.73m ²)	Dosage and frequency
Normal	≥ 80	500 to 1,500 mg twice daily
Mild	50-79	500 to 1,000 mg twice daily
Moderate	30-49	250 to 750 mg twice daily
Severe	< 30	250 to 500 mg twice daily

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End-stage renal disease patients undergoing dialysis ⁽¹⁾ .	-	500 to 1,000 mg once daily ⁽²⁾
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- ⁽¹⁾ A 750 mg loading dose is recommended on the first day of treatment with levetiracetam.
⁽²⁾ Following dialysis, a 250 to 500 mg supplemental dose is recommended.

For children with renal impairment, levetiracetam dose needs to be adjusted based on the renal function as levetiracetam clearance is related to renal function.
 This recommendation is based on a study in adult renally impaired patients.

The CLcr in ml/min/1.73 m² may be estimated from serum creatinine (mg/dl) determination using, for young adolescents and children using the following formula (Schwartz formula):

$$\text{CLcr (ml/min/1.73 m}^2\text{)} = \frac{\text{Height (cm) x ks}}{\text{Serum Creatinine (mg/dl)}}$$

ks= 0.45 in Term infants to 1 year old; ks= 0.55 in Children to less than 13 years and in adolescent female; ks= 0.7 in adolescent male

Dosing adjustment for infants, children and adolescents patients weighing less than 50 kg with impaired renal function

Group	Creatinine clearance (ml/min/1.73m ²)	Dosage and frequency ⁽¹⁾	
		Infants 1 to less than 6 months	Infants 6 to 23 months, children and adolescents weighing less than 50 kg
Normal	≥ 80	7 to 21 mg/kg (0.07 to 0.21 ml/kg) twice daily	10 to 30 mg/kg (0.10 to 0.30 ml/kg) twice daily

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Mild	50-79	7 to 14 mg/kg (0.07 to 0.14 ml/kg) twice daily	10 to 20 mg/kg (0.10 to 0.20 ml/kg) twice daily
Moderate	30-49	3.5 to 10.5 mg/kg (0.035 to 0.105 ml/kg) twice daily	5 to 15 mg/kg (0.05 to 0.15 ml/kg) twice daily
Severe	< 30	3.5 to 7 mg/kg (0.035 to 0.07 ml/kg) twice daily	5 to 10 mg/kg (0.05 to 0.10 ml/kg) twice daily
End-stage renal disease patients undergoing dialysis	-	7 to 14 mg/kg (0.07 to 0.14 ml/kg) once daily ⁽²⁾ (4)	10 to 20 mg/kg (0.10 to 0.20 ml/kg) once daily ⁽³⁾ (5)

⁽¹⁾ Levetiracetam oral solution should be used for doses under 250 mg, for doses not multiple of 250 mg when dosing recommendation is not achievable by taking multiple tablets and for patients unable to swallow tablets.

⁽²⁾ A 10.5 mg/kg (0.105 ml/kg) loading dose is recommended on the first day of treatment with levetiracetam.

⁽³⁾ A 15 mg/kg (0.15 ml/kg) loading dose is recommended on the first day of treatment with levetiracetam.

⁽⁴⁾ Following dialysis, a 3.5 to 7 mg/kg (0.035 to 0.07 ml/kg) supplemental dose is recommended.

⁽⁵⁾ Following dialysis, a 5 to 10 mg/kg (0.05 to 0.10 ml/kg) supplemental dose is recommended.

Hepatic impairment

No dose adjustment is needed in patients with mild to moderate hepatic impairment. In patients with severe hepatic impairment, the creatinine clearance may underestimate the renal

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insufficiency. Therefore a 50 % reduction of the daily maintenance dose is recommended when the creatinine clearance is $< 60 \text{ ml/min/1.73 m}^2$.

4.3 Contraindications

Levetiracetam is contraindicated in:

- hypersensitivity to the active substance or other pyrrolidone derivatives or to any of the excipients.

4.4 Special Warnings and Precautions for use

Discontinuation

If levetiracetam has to be discontinued it is recommended to withdraw it gradually (e.g. in adults and adolescents weighing more than 50 kg: 500 mg decreases twice daily every two to four weeks; in infants older than 6 months, children and adolescents weighing less than 50 kg: dose decrease should not exceed 10 mg/kg twice daily every two weeks; in infants less than 6 months: dose decrease should not exceed 7 mg/kg twice daily every two weeks).

Renal or hepatic impairment

The administration of levetiracetam to patients with renal impairment may require dose adjustment. In patients with severely impaired hepatic function, assessment of renal function is recommended before dose selection (*see Section Dosage and Administration*).

Acute kidney injury

The use of levetiracetam has been very rarely associated with acute kidney injury, with a time to onset ranging from a few days to several months.

Blood cell counts

Rare cases of decreased blood cell counts (neutropenia, agranulocytosis, leucopenia, thrombocytopenia and pancytopenia) have been described in association with levetiracetam administration, generally at the beginning of the treatment. Complete blood cell counts are advised in patients experiencing important weakness, pyrexia, recurrent infections or coagulation disorders (*see Section Adverse Reactions*).

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Depression and/or suicidal ideation

Suicide, suicide attempt, suicidal ideation and behaviour have been reported in patients treated with anti-epileptic agents (including levetiracetam). A meta-analysis of randomized placebo-controlled trials of anti-epileptic medicinal products has shown a small increased risk of suicidal thoughts and behaviour. The mechanism of this risk is not known.

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

Abnormal and aggressive behaviours

Levetiracetam may cause psychotic symptoms and behavioural abnormalities including irritability and aggressiveness. Patients treated with levetiracetam should be monitored for developing psychiatric signs suggesting important mood and/or personality changes. If such behaviours are noticed, treatment adaptation or gradual discontinuation should be considered. If discontinuation is considered, please see Section *Discontinuation in Warnings and Precautions*.

Worsening of seizures

As with other types of antiepileptic drugs, levetiracetam may rarely exacerbate seizure frequency or severity. This paradoxical effect was mostly reported within the first month after levetiracetam initiation or increase of the dose, and was reversible upon drug discontinuation or dose decrease. Patients should be advised to consult their physician immediately in case of aggravation of epilepsy. Lack of efficacy or seizure worsening has for example been reported in patients with epilepsy associated with sodium voltage-gated channel alpha subunit 8 (SCN8A) mutations.

Electrocardiogram QT interval prolongation

Rare cases of ECG QT interval prolongation have been observed during the post-marketing surveillance. Levetiracetam should be used with caution in patients with QTc-interval prolongation, in patients concomitantly treated with drugs affecting the QTc-interval, or in patients with relevant preexisting cardiac disease or electrolyte disturbances.

Paediatric population

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The tablet formulation is not adapted for use in infants and children under the age of 6 years.

Available data in children did not suggest impact on growth and puberty. However, long term effects on learning, intelligence, growth, endocrine function, puberty and childbearing potential in children remain unknown.

Excipients

Film-coated tablets

Levetiracetam 750 mg film-coated tablets contain sunset yellow lake (E110) colouring agent which may cause allergic-type reactions.

4.5 Interactions with other medicinal products and other forms of interaction

Antiepileptic medicinal products

Pre-marketing data from clinical studies conducted in adults indicate that levetiracetam did not influence the serum concentrations of existing antiepileptic medicinal products (phenytoin, carbamazepine, valproic acid, phenobarbital, lamotrigine, gabapentin and primidone) and that these antiepileptic medicinal products did not influence the pharmacokinetics of levetiracetam. As in adults, there is no evidence of clinically significant medicinal product interactions in paediatric patients receiving up to 60 mg/kg/day levetiracetam.

A retrospective assessment of pharmacokinetic interactions in children and adolescents with epilepsy (4 to 17 years) confirmed that adjunctive therapy with orally administered levetiracetam did not influence the steady-state serum concentrations of concomitantly administered carbamazepine and valproate. However, data suggested a 20 % higher levetiracetam clearance in children taking enzyme-inducing antiepileptic medicinal products. Dose adjustment is not required.

Probenecid

Probenecid (500 mg four times daily), a renal tubular secretion blocking agent, has been shown to inhibit the renal clearance of the primary metabolite, but not of levetiracetam. Nevertheless, the concentration of this metabolite remains low.

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Methotrexate

Concomitant administration of levetiracetam and methotrexate has been reported to decrease methotrexate clearance, resulting in increased/prolonged blood methotrexate concentration to potentially toxic levels. Blood methotrexate and levetiracetam levels should be carefully monitored in patients treated concomitantly with the two drugs.

Oral contraceptives, digoxin and warfarin

Levetiracetam 1,000 mg daily did not influence the pharmacokinetics of oral contraceptives (ethinyl-estradiol and levonorgestrel); endocrine parameters (luteinizing hormone and progesterone) were not modified. Levetiracetam 2,000 mg daily did not influence the pharmacokinetics of digoxin and warfarin; prothrombin times were not modified. Co-administration with digoxin, oral contraceptives and warfarin did not influence the pharmacokinetics of levetiracetam.

Laxatives

There have been isolated reports of decreased levetiracetam efficacy when the osmotic laxative macrogol has been concomitantly administered with oral levetiracetam. Therefore, macrogol should not be taken orally for one hour before and for one hour after taking levetiracetam.

Food and alcohol

The extent of absorption of levetiracetam was not altered by food, but the rate of absorption was slightly reduced.

No data on the interaction of levetiracetam with alcohol are available.

4.6 Fertility, pPregnancy, and Lactation

Fertility

No impact on fertility was detected in animal studies. No clinical data are available, potential risk for human is unknown.

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Women of childbearing potential

Specialist advice should be given to women who are of childbearing potential. Treatment with levetiracetam should be reviewed when a woman is planning to become pregnant. As with all antiepileptic medicines, sudden discontinuation of levetiracetam should be avoided as this may lead to breakthrough seizures that could have serious consequences for the woman and the unborn child. Monotherapy should be preferred whenever possible because therapy with multiple antiepileptic medicines AEDs could be associated with a higher risk of congenital malformations than monotherapy, depending on the associated antiepileptics.

Pregnancy

A large amount of postmarketing data on pregnant women exposed to levetiracetam monotherapy (more than 1800, among which in more than 1500 exposure occurred during the first trimester) do not suggest an increase in the risk for major congenital malformations. Only limited evidence is available on the neurodevelopment of children exposed to levetiracetam monotherapy in utero. However, current epidemiological studies (on about 100 children) do not suggest an increased risk of neurodevelopmental disorders or delays.

Levetiracetam can be used during pregnancy, if after careful assessment it is considered clinically needed. In such case, the lowest effective dose is recommended.

Physiological changes during pregnancy may affect levetiracetam concentration. Decrease in levetiracetam plasma concentrations has been observed during pregnancy. This decrease is more pronounced during the third trimester (up to 60% of baseline concentration before pregnancy). Appropriate clinical management of pregnant women treated with levetiracetam should be ensured.

Lactation

Levetiracetam is excreted in human breast milk. Therefore, breast-feeding is not recommended. However, if levetiracetam treatment is needed during breastfeeding, the benefit/ risk of the treatment should be weighed considering the importance of breastfeeding.

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4.7 Effects on Ability to drive and use machines perform tasks that require judgement, motor or cognitive skills

Levetiracetam has minor or moderate influence on the ability to drive and use machines.

Due to possible different individual sensitivity, some patients might experience somnolence or other central nervous system related symptoms, especially at the beginning of treatment or following a dose increase. Therefore, caution is recommended in those patients when performing skilled tasks, e.g. driving vehicles or operating machinery. Patients are advised not to drive or use machines until it is established that their ability to perform such activities is not affected.

4.8 Undesirable effects Adverse Reactions

Clinical Trial Data and Post Marketing Data

Summary of the safety profile

The adverse event profile presented below is based on the analysis of pooled placebo-controlled clinical trials with all indications studied, with a total of 3,416 patients treated with levetiracetam. These data are supplemented with the use of levetiracetam in corresponding open-label extension studies, as well as post-marketing experience. The most frequently reported adverse reactions were nasopharyngitis, somnolence, headache, fatigue and dizziness. The safety profile of levetiracetam is generally similar across age groups (adult and paediatric patients) and across the approved epilepsy indications.

Adverse drug reactions (ADRs) are listed below by MedDRA system organ class and by frequency.

Frequencies are defined as:

Very common $\geq 1/10$

Common $\geq 1/100$ to $< 1/10$

Uncommon $\geq 1/1000$ to $< 1/100$

Rare $\geq 1/10000$ to $< 1/1000$

Very rare $< 1/10000$

Not known (cannot be estimated from the available data).

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Infections and infestations

Very common: nasopharyngitis

Rare: infection

Blood and lymphatic system disorders

Uncommon: thrombocytopenia, leukopenia

Rare: pancytopenia, neutropenia, agranulocytosis

Immune system disorders

Rare: drug reaction with eosinophilia and systemic symptoms (DRESS)⁽¹⁾, hypersensitivity (including angioedema and anaphylaxis)

Metabolism and nutrition disorders

Common: anorexia

Uncommon: weight decreased, weight increase

Rare: hyponatraemia

Psychiatric disorders

Common: depression, hostility/ aggression, anxiety, insomnia, nervousness/ irritability

Uncommon: suicide attempt, suicidal ideation, psychotic disorder, abnormal behaviour, hallucination, anger, confusional state, panic attack, affect lability/ mood swings, agitation

Rare: completed suicide, personality disorder, thinking abnormal, delirium

Very rare: Obsessive compulsive disorder^{**⁽²⁾}

Nervous system disorders

Very common: somnolence, headache

Common: convulsion, balance disorder, dizziness, lethargy, tremor

Uncommon: amnesia, memory impairment, coordination abnormal/ ataxia, paraesthesia, disturbance in attention

Rare: choreoathetosis, dyskinesia, hyperkinesia, gait disturbance, encephalopathy, seizures aggravated, Neuroleptic malignant syndrome^{*⁽³⁾}

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Eye disorders

Uncommon: diplopia, vision blurred

Ear and labyrinth disorders

Common: vertigo

Cardiac disorders

Rare: electrocardiogram QT prolonged

Respiratory, thoracic and mediastinal disorders

Common: cough

Gastrointestinal disorders

Common: abdominal pain, diarrhoea, dyspepsia, vomiting, nausea

Rare: pancreatitis

Hepatobiliary disorders

Uncommon: liver function test abnormal

Rare: hepatic failure, hepatitis

Renal and urinary disorders

Rare: acute kidney injury

Skin and subcutaneous tissue disorders

Common: rash

Uncommon: alopecia, eczema, pruritus,

Rare: toxic epidermal necrolysis, Stevens-Johnson syndrome, erythema multiforme

Musculoskeletal and connective tissue disorders

Uncommon: muscular weakness, myalgia

Rare: rhabdomyolysis and blood creatine phosphokinase increased*

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General disorders and administration site conditions

Common: asthenia/fatigue

Injury, poisoning and procedural complications

Uncommon: injury

(1) See Description of selected adverse reactions.

(2) Very rare cases of development of obsessive-compulsive disorders (OCD) in patients with underlying history of OCD or psychiatric disorders have been observed in post-marketing surveillance.

(3) *Prevalence is significantly higher in Japanese patients when compared to non-Japanese patients.

~~**Very rare cases of development of obsessive-compulsive disorders (OCD) in patients with underlying history of OCD or psychiatric disorders have been observed in post-marketing surveillance.~~

Description of selected adverse reactions

Multiorgan hypersensitivity reactions

Multiorgan hypersensitivity reactions (also known as Drug Reaction with Eosinophilia and Systemic Symptoms, DRESS) have been reported rarely in patients treated with levetiracetam. Clinical manifestations may develop 2 to 8 weeks after starting treatment. These reactions are variable in expression, but typically present with fever, rash, facial oedema, lymphadenopathies, haematologic abnormalities and can be associated with involvement of different organ systems, mostly the liver. If multiorgan hypersensitivity reaction is suspected, levetiracetam should be discontinued.

The risk of anorexia is higher when levetiracetam is co-administered with topiramate.
In several cases of alopecia, recovery was observed when levetiracetam was discontinued.
Bone marrow suppression was identified in some of the cases of pancytopenia.

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Case of encephalopathy generally occurred at the beginning of the treatment (few days to a few months) and were reversible after treatment discontinuation.

Paediatric population

In patients aged 1 month to less than 4 years, a total of 190 patients have been treated with levetiracetam in placebo controlled and open label extension studies. Sixty of these patients were treated with levetiracetam in placebo-controlled studies. In patients aged 4-16 years, a total of 645 patients have been treated with levetiracetam in placebo-controlled and open label extension studies. 233 of these patients were treated with levetiracetam in placebo-controlled studies. In both these paediatric age ranges, these data are supplemented with the post-marketing experience of the use of levetiracetam.

In addition, 101 infants aged less than 12 months have been exposed in a post authorization safety study. No new safety concerns for levetiracetam were identified for infants less than 12 months of age with epilepsy.

The adverse event profile of levetiracetam is generally similar across age groups and across the approved epilepsy indications. Safety results in paediatric patients in placebo-controlled clinical studies were consistent with the safety profile of levetiracetam in adults except for behavioural and psychiatric adverse reactions which were more common in children than in adults. In children and adolescents aged 4 to 16 years, vomiting (very common, 11.2%), agitation (common, 3.4%), mood swings (common, 2.1%), affect lability (common, 1.7%), aggression (common, 8.2%), abnormal behaviour (common, 5.6%), and lethargy (common, 3.9%) were reported more frequently than in other age ranges or in the overall safety profile. In infants and children aged 1 month to less than 4 years, irritability (very common, 11.7%) and coordination abnormal (common, 3.3%) were reported more frequently than in other age groups or in the overall safety profile.

A double-blind, placebo-controlled paediatric safety study with a non-inferiority design has assessed the cognitive and neuropsychological effects of levetiracetam in children 4 to 16 years of age with partial onset seizures. It was concluded that levetiracetam was not different (non inferior) from placebo with regard to the change from baseline of the Leiter-R Attention and Memory, Memory Screen Composite score in the per-protocol population. Results related to behavioural

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and emotional functioning indicated a worsening in levetiracetam treated patients on aggressive behaviour as measured in a standardised and systematic way using a validated instrument (CBCL – Achenbach Child Behavior Checklist). However subjects, who took levetiracetam in the long term open label follow-up study, did not experience a worsening, on average, in their behavioural and emotional functioning; in particular measures of aggressive behaviour were not worse than baseline.

4.9 Overdosage

Symptoms and signs

Somnolence, agitation, aggression, depressed level of consciousness, respiratory depression and coma were observed with levetiracetam overdoses.

Treatment

There is no specific antidote for levetiracetam. Treatment of an overdose will be symptomatic and may include haemodialysis. The dialyser extraction efficiency is 60 % for levetiracetam and 74 % for the primary metabolite.

Further management should be as clinically indicated or as recommended by the national poisons centre, where available.

5 Clinical PHARMACOLOGICALy PROPERTIES

5.1 Pharmacodynamics properties

Pharmacotherapeutic group

Antiepileptics; Other Antiepileptics

ATC Code

N03AX14

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Mechanism of aAction

The active substance, levetiracetam, is a pyrrolidone derivative (S-enantiomer of α -ethyl-2-oxo-1-pyrrolidine acetamide), chemically unrelated to existing antiepileptic active substances.

The mechanism of action of levetiracetam still remains to be fully elucidated. *In vitro* and *in vivo* experiments suggest that levetiracetam does not alter basic cell characteristics and normal neurotransmission.

In vitro studies show that levetiracetam affects intraneuronal Ca^{2+} levels by partial inhibition of N-type Ca^{2+} currents and by reducing the release of Ca^{2+} from intraneuronal stores. In addition it partially reverses the reductions in GABA- and glycine-gated currents induced by zinc and β -carbolines. Furthermore, levetiracetam has been shown in *in vitro* studies to bind to a specific site in rodent brain tissue. This binding site is the synaptic vesicle protein 2A, believed to be involved in vesicle fusion and neurotransmitter exocytosis. Levetiracetam and related analogs show a rank order of affinity for binding to the synaptic vesicle protein 2A which correlates with the potency of their anti-seizure protection in the mouse audiogenic model of epilepsy. This finding suggests that the interaction between levetiracetam and the synaptic vesicle protein 2A seems to contribute to the antiepileptic mechanism of action of the medicinal product.

Pharmacodynamic effects

Levetiracetam induces seizure protection in a broad range of animal models of partial and primary generalised seizures without having a pro-convulsant effect. The primary metabolite is inactive.

In man, an activity in both partial and generalised epilepsy conditions (epileptiform discharge/ photoparoxysmal response) has confirmed the broad spectrum pharmacological profile of levetiracetam.

5.2 Pharmacokinetics properties

Levetiracetam is a highly soluble and permeable compound. The pharmacokinetic profile is linear with low intra- and intersubject variability. There is no modification of the clearance after repeated administration. The time independent pharmacokinetic profile of levetiracetam was also confirmed following 1500 mg intravenous infusion for 4 days with twice daily dosing dosing.

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There is no evidence for any relevant gender, race or circadian variability. The pharmacokinetic profile is comparable in healthy volunteers and in patients with epilepsy.

Due to its complete and linear absorption, plasma levels can be predicted from the oral dose of levetiracetam expressed as mg/kg bodyweight. Therefore, there is no need for plasma level monitoring of levetiracetam.

A significant correlation between saliva and plasma concentrations has been shown in adults and children (ratio of saliva/plasma concentrations ranged from 1 to 1.7 for oral tablet formulation and after 4 hours post-dose for oral solution formulation).

The pharmacokinetic profile has been characterized following oral administration. A single dose of 1500 mg levetiracetam diluted in 100 ml of a compatible diluent and infused intravenously over 15 minutes is bioequivalent to 1500 mg levetiracetam oral intake, given as three 500 mg tablets.

The intravenous administration of doses up to 4000 mg diluted in 100 ml of 0.9 % sodium chloride infused over 15 minutes and doses up to 2500 mg diluted in 100 ml of 0.9 % sodium chloride infused over 5 minutes was evaluated. The pharmacokinetic and safety profiles did not identify any safety concerns.

Absorption

Levetiracetam is rapidly absorbed after oral administration. Oral absolute bioavailability is close to 100 %.

Peak plasma concentrations (C_{max}) are achieved at 1.3 hours after dosing. Steady-state is achieved after two days of a twice daily administration schedule.

Peak concentrations (C_{max}) are typically 31 and 43 µg/ml following a single 1,000 mg dose and repeated 1,000 mg twice daily dose, respectively.

The extent of absorption is dose-independent and is not altered by food.

Distribution

No tissue distribution data are available in humans.

Neither levetiracetam nor its primary metabolite are significantly bound to plasma proteins (< 10 %). The volume of distribution of levetiracetam is approximately 0.5 to 0.7 l/kg, a value close to the total body water volume.

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Peak plasma concentration (C_{max}) observed in 17 subjects following a single intravenous dose of 1500 mg infused over 15 minutes was 51 ± 19 $\mu\text{g/mL}$ (arithmetic average \pm standard deviation).

Biotransformation Metabolism

Levetiracetam is not extensively metabolised in humans. The major metabolic pathway (24 % of the dose) is an enzymatic hydrolysis of the acetamide group. Production of the primary metabolite, ucb L057, is not supported by liver cytochrome P450 isoforms. Hydrolysis of the acetamide group was measurable in a large number of tissues including blood cells. The metabolite ucb L057 is pharmacologically inactive.

Two minor metabolites were also identified. One was obtained by hydroxylation of the pyrrolidone ring (1.6 % of the dose) and the other one by opening of the pyrrolidone ring (0.9 % of the dose).

Other unidentified components accounted only for 0.6 % of the dose.

No enantiomeric interconversion was evidenced *in vivo* for either levetiracetam or its primary metabolite.

In vitro, levetiracetam and its primary metabolite have been shown not to inhibit the major human liver cytochrome P₄₅₀ isoforms (CYP3A4, 2A6, 2C9, 2C19, 2D6, 2E1 and 1A2), glucuronyl transferase (UGT1A1 and UGT1A6) and epoxide hydroxylase activities. In addition, levetiracetam does not affect the *in vitro* glucuronidation of valproic acid.

In human hepatocytes in culture, levetiracetam had little or no effect on CYP1A2, SULT1E1 or UGT1A1. Levetiracetam caused mild induction of CYP2B6 and CYP3A4. The *in vitro* data and *in vivo* interaction data on oral contraceptives, digoxin and warfarin indicate that no significant enzyme induction is expected *in vivo*. Therefore, the interaction of levetiracetam with other substances, or vice versa, is unlikely.

Elimination

The plasma half-life in adults was 7 ± 1 hours and did not vary either with dose, route of administration or repeated administration. The mean total body clearance was 0.96 ml/min/kg.

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The major route of excretion was via urine, accounting for a mean 95 % of the dose (approximately 93 % of the dose was excreted within 48 hours). Excretion via faeces accounted for only 0.3 % of the dose.

The cumulative urinary excretion of levetiracetam and its primary metabolite accounted for 66 % and 24 % of the dose, respectively during the first 48 hours.

The renal clearance of levetiracetam and ucb L057 is 0.6 and 4.2 ml/min/kg respectively indicating that levetiracetam is excreted by glomerular filtration with subsequent tubular reabsorption and that the primary metabolite is also excreted by active tubular secretion in addition to glomerular filtration. Levetiracetam elimination is correlated to creatinine clearance.

Special patient populations

Children

Children (4 to 12 years)

Following single oral dose administration (20 mg/kg) to epileptic children (6 to 12 years), the half-life of levetiracetam was 6.0 hours. The apparent body weight adjusted clearance was approximately 30 % higher than in epileptic adults.

Following repeated oral dose administration (20 to 60 mg/kg/day) to epileptic children (4 to 12 years), levetiracetam was rapidly absorbed. Peak plasma concentration was observed 0.5 to 1.0 hour after dosing. Linear and dose proportional increases were observed for peak plasma concentrations and area under the curve. The elimination half-life was approximately 5 hours. The apparent body clearance was 1.1 ml/min/kg.

Infants and children (1 month to 4 years)

Following single dose administration (20 mg/kg) of a 100 mg/ml oral solution to epileptic children (1 month to 4 years), levetiracetam was rapidly absorbed and peak plasma concentrations were observed approximately 1 hour after dosing. The pharmacokinetic results indicated that half-life was shorter (5.3 h) than for adults (7.2 h) and apparent clearance was faster (1.5 ml/min/kg) than for adults (0.96 ml/min/kg).

In the population pharmacokinetic analysis conducted in patients from 1 month to 16 years of age, body weight was significantly correlated to apparent clearance (clearance increased with an

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increase in body weight) and apparent volume of distribution. Age also had an influence on both parameters. This effect was pronounced for the younger infants, and subsided as age increased, to become negligible around 4 years of age.

In both population pharmacokinetic analyses, there was about a 20 % increase of apparent clearance of levetiracetam when it was co-administered with an enzyme inducing antiepileptic medicinal product.

Elderly

In the elderly, the half-life is increased by about 40 % (10 to 11 hours). This is related to the decrease in renal function in this population.

Renal impairment

The apparent body clearance of both levetiracetam and of its primary metabolite is correlated to the creatinine clearance. It is therefore recommended to adjust the maintenance daily dose of levetiracetam, based on creatinine clearance in patients with moderate and severe renal impairment.

In anuric end-stage renal disease adult subjects the half-life was approximately 25 and 3.1 hours during interdialytic and intradialytic periods, respectively.

The fractional removal of levetiracetam was 51 % during a typical 4-hour dialysis session.

Hepatic impairment

In subjects with mild and moderate hepatic impairment, there was no relevant modification of the clearance of levetiracetam.

In most subjects with severe hepatic impairment, the clearance of levetiracetam was reduced by more than 50 % due to a concomitant renal impairment.

Clinical Studies

Not relevant for this product.

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5.3 Preclinical safety data NON-CLINICAL INFORMATION

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

Adverse effects not observed in clinical studies but seen in the rat and to a lesser extent in the mouse at exposure levels similar to human exposure levels and with possible relevance for clinical use were liver changes, indicating an adaptive response such as increased weight and centrilobular hypertrophy, fatty infiltration and increased liver enzymes in plasma.

No adverse effects on male or female fertility or reproduction performance were observed in rats at doses up to 1800 mg/kg/day (x 6 the MRHD on a mg/m² or exposure basis) in parents and F1 generation.

Two embryo-foetal development (EFD) studies were performed in rats at 400, 1200 and 3600 mg/kg/day. At 3600 mg/kg/day, in only one of the 2 EFD studies, there was a slight decrease in foetal weight associated with a marginal increase in skeletal variations/minor anomalies. There was no effect on embryo mortality and no increased incidence of malformations. The NOAEL (No Observed Adverse Effect Level) was 3600 mg/kg/day for pregnant female rats (x 12 the MRHD on a mg/m² basis) and 1200 mg/kg/day for foetuses.

Four embryo-foetal development studies were performed in rabbits covering doses of 200, 600, 800, 1200 and 1800 mg/kg/day. The dose level of 1800 mg/kg/day induced a marked maternal toxicity and a decrease in foetal weight associated with increased incidence of foetuses with cardiovascular/skeletal anomalies. The NOAEL was <200 mg/kg/day for the dams and 200 mg/kg/day for the foetuses (equal to the MRHD on a mg/m² basis).

A peri- and post-natal development study was performed in rats with levetiracetam doses of 70, 350 and 1800 mg/kg/day. The NOAEL was ≥ 1800 mg/kg/day for the F0 females, and for the survival, growth and development of the F1 offspring up to weaning (x 6 the MRHD on a mg/m² basis).

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Neonatal and juvenile animal studies in rats and dogs demonstrated that there were no adverse effects seen in any of the standard developmental or maturation endpoints at doses up to 1800 mg/kg/day (x 6–17 the MRHD on a mg/m² basis).

Environmental Risk Assessment (ERA)

The use of levetiracetam in accordance with the product information is not likely to result in an unacceptable environmental impact (*see Section Incompatibilities and Use and Handling*).

6 PHARMACEUTICAL PARTICULARS INFORMATION

6.1 List of Excipients

Keppra, film-coated tablets: Sodium croscarmellose, Macrogol, Colloidal Anhydrous silica, Magnesium stearate, Opadry film coating

Keppra 100 mg/mL Oral Solution: Sodium citrate, Citric acid monohydrate, Methyl parahydroxybenzoate, Propyl parahydroxybenzoate, Ammonium glycyrrhizate, Glycerol, Maltitol liquid, Acesulfame potassium, Grape flavor Firmenich

Keppra Sterile Concentrate for Solution for Infusion: Sodium acetate trihydrate, Sodium chloride, acetic acid

6.2 Incompatibilities

Keppra, 100 mg/ml, concentrate for solution for infusion

This medicinal product must not be mixed with other medicinal products except those mentioned below. Levetiracetam concentrate was found to be physically compatible and chemically stable when mixed with the following diluents for at least 24 hours and stored in PVC bags at controlled room temperature 15- 25°C.

Diluents:

- Sodium chloride (0.9%) injection
- Lactated Ringer's injection
- Dextrose 5% injection

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6.3 Shelf Life

Keppra Tablets and Oral solution: 36 Months

Keppra Infusion: 24 Months

6.4 Special precautions for Storage

Store below 30°C

6.5 Nature and Contents of the Container

Keppra, 250 mg, film-coated tablets Blue, oblong film-coated tablet scored and debossed with the code ucb and 250 on one side. The score line is only to facilitate breaking for ease of swallowing and not to divide into equal doses.

Keppra, 750 mg, film-coated tablets Orange, oblong film-coated tablet scored and debossed with the code ucb and 750 on one side. The score line is only to facilitate breaking for ease of swallowing and not to divide into equal doses.

Keppra 250mg and 750mg film-coated tablets are packaged in Aluminium/PVC blisters placed into cardboard boxes containing 60 tablets.

Keppra 100 mg/ml concentrate for solution for infusion is a clear, colourless, Concentrate, solution for infusion is packed in 5 ml glass vials (type I) closed by a Teflon-faced grey chlorobutyl rubber stopper or an uncoated grey bromobutyl rubber stopper and sealed with an aluminium/polypropylene flip cap. Each carton contains 10 vials.

6.6 Special precautions for disposal and other handling

Incompatibilities and Use and Handling

Levetiracetam, 100 mg/ml concentrate for solution for infusion

Table presents the recommended preparation and administration of levetiracetam concentrate to achieve a total daily dose of 500 mg, 1,000 mg, 2,000 mg, or 3,000 mg in two divided doses.

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Dose	Withdrawal Volume	Volume of Diluent	Infusion time	Frequency of administration	Total Daily Dose
250 mg	2.5 ml (half 5 ml vial)	100 ml	15 minutes	Twice daily	500 mg/day
500 mg	5 ml (one 5 ml vial)	100 ml	15 minutes	Twice daily	1000 mg/day
1000 mg	10 ml (two 5 ml vials)	100 ml	15 minutes	Twice daily	2000 mg/day
1500 mg	15 ml (three 5 ml vials)	100 ml	15 minutes	Twice daily	3000 mg/day

This medicinal product is for single use only, any unused solution should be discarded.

~~This medicinal product must not be mixed with other medicinal products except those mentioned below. Levetiracetam concentrate was found to be physically compatible and chemically stable when mixed with the following diluents for at least 24 hours and stored in PVC bags at controlled room temperature 15–25°C.~~

~~Diluents:~~

- ~~Sodium chloride (0.9%) injection~~
- ~~Lactated Ringer's injection~~
- ~~Dextrose 5% injection~~

Medicinal product with particulate matter or discolouration should not be used.

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

7. MARKETING AUTHORISATION HOLDER AND MANUFACTURING SITE ADDRESSES

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Keppra IV infusion Manufactured by:
Manufacturing and primary packaging site:

Patheon Italia S.p.A.
Monza Operations
Viale G .B. Stucchi, 110
20900 Monza (MB)
Italy

Secondary packaging and batch release:

Aesica Pharmaceuticals S.r.l.
Via Praglia, 15
10044 Pianezza (TO)
Italy

Keppra Tablets Manufactured by:

UCB Pharma SA, Chemin du Foriest, 1420 Braine-l'Alleud, Belgium.

Keppra Oral Solution is Manufactured by:

NextPharma SAS,
17,Route de Meulan, F-78520 Limay, France

8. MARKETING AUTHORISATION NUMBER(S)

9. DATE OF FIRST AUTHORISATION/RENEWAL OF THE AUTHORISATION

10. DATE OF REVISION OF THE TEXT

November 2025

Version Number: 13
Version Date: 07 October 2025

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To report any Adverse events, please contact: pm.safety@gsk.com

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GLOBAL PATIENT LEAFLET
Keppra 250 mg;
750 mg; film-coated tablets
Keppra 100mg/ml oral solution
Levetiracetam

Read all of this leaflet carefully before you start taking this medicine.

- Keep this leaflet. You may need to read it again.
- If you have any questions, ask your doctor or pharmacist.
- This medicine has been prescribed for you personally or your child.
Don't pass it on to other people - it may harm them even if their symptoms seem to be the same as yours.
- If any of the side effects gets serious, or if you notice any side effects not listed in this leaflet, please tell your doctor or pharmacist.

In this leaflet

- 1. What Keppra is and what it is used for**
- 2. Before you take Keppra**
- 3. How to take Keppra**
- 4. Possible side effects**
- 5. How to store Keppra**
- 6. Further information**

1. What KEPPRA is and what it is used for

Keppra contains the active ingredient levetiracetam. It belongs to antiepileptic medicines, which are used to treat fits (*seizures*) in epilepsy.

On its own, Keppra is used to treat:

- partial onset seizure with or without secondary generalisation (the epilepsy form in which the fits initially affect only one side of the brain, but could thereafter extend to larger areas on both sides of the brain) - in adults and adolescents from 16 years of age with newly diagnosed epilepsy

As an add-on to other antiepileptic medicines, Keppra is used to treat:

- partial onset seizures with or without generalisation in adults, adolescents, children and infants from one month of age with epilepsy
- myoclonic seizures (short, shock-like jerks of a muscle or group of muscles) in adults and adolescents from 12 years of age with juvenile myoclonic epilepsy
- primary generalised tonic-clonic seizures (major fits, including loss of consciousness) in adults and adolescents from 12 years of age with idiopathic generalised epilepsy (the type of epilepsy that is thought to have a genetic cause)

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2. Before you take KEPPRA

Don't take Keppra

- if you are **allergic** (*hypersensitive*) to levetiracetam, other pyrrolidone derivatives, or any other ingredients of Keppra (listed in Section 6)
- If you think any of these apply to you, **don't take Keppra** until you have checked with your doctor.

Take special care with Keppra

Before you take Keppra your doctor needs to know:

- if you have **kidney problems or severe liver disease**, your doctor may need to adjust your dose of Keppra
 - if you are **pregnant or breastfeeding**, think you may be pregnant or are planning to have a baby (see *Pregnancy and breast-feeding* later in section 2)
 - if you are **taking any other medicines** (see *Other medicines and Keppra*)
 - if you are **over 65**
 - if you have a family or medical history of heart problems, for example disturbance in heart rhythm or (visible on an electrocardiogram) if you are taking any other medicine that makes you prone to have disturbance in heart rhythm or unusual amount of salt in the body.
- **Check with your doctor** if you think any of these may apply to you. Your doctor will decide whether Keppra is suitable for you.

Keppra film-coated tablets are not recommended for children under 6 years.

Keppra oral solution is the preferred formulation for use in infants and children **under the age of 6 years**.

Keppra is not indicated in children and adolescents below 16 years on its own (as monotherapy) (see *What Keppra is and what it is used for* in Section 1).

While you are taking Keppra

- If you notice any slowdown in the growth or unexpected puberty development of your child, **contact your doctor**.
- A small number of people being treated with anti-epileptics such as Keppra have had **thoughts of harming or killing themselves**. If at any time you have these thoughts, **immediately contact your doctor**.
- If you notice any abnormal and aggressive behaviours, or if you or your family and friends notice important changes in mood or behaviour, immediately contact your doctor.
- Your seizures may rarely become worse or happen more often, mainly during the first month after starting the treatment or increase of the dose of Keppra. If you notice any of these symptoms while taking Keppra, immediately contact your doctor. In a very rare form of early-onset epilepsy (epilepsy associated with SCN8A mutations) that causes multiple types of seizures and loss of skills you may notice that the seizures remain present or are becoming worse during your treatment.

Conditions you need to look out for

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Keppra can make some existing conditions worse, or cause serious side effects such as **severe allergic reactions, serious skin reactions, Drug Reaction with Eosinophilia and Systemic Symptoms (DRESS), sudden decrease of kidney function, encephalopathy** (degenerative disease of the brain), **depression or suicidal thoughts**. You must look out for certain symptoms while you are taking Keppra, to reduce the risk of any problems. See '*Conditions you need to look out for*' in Section 4.

Other medicines and Keppra

Tell your doctor or pharmacist if you're taking any other medicines, if you've taken any recently, or if you start taking new ones. This includes medicines bought without a prescription.

Don't take **macrogol** (a drug used as **laxative**) for one hour before and one hour after taking Keppra as this may result in a loss of its effect.

You will be closely monitored if you are taking Keppra with:

- methotrexate (used to treat certain types of **cancer**)

Some other medicines may affect how Keppra works, or make it more likely that you'll have side effects. Keppra can also affect how some other medicines work. These include:

- probenecid (used to treat **gout**)

→ **Tell your doctor or pharmacist** if you are taking any of these.

Pregnancy and breast-feeding

Keppra is not recommended for use during pregnancy.

- **Tell your doctor if you are pregnant** or planning to become pregnant.
- Use a **reliable method of contraception** while you're taking Keppra, to prevent pregnancy.
- **If you do become pregnant during treatment** with Keppra, tell your doctor.

Keppra can be used during pregnancy, only if after careful assessment it is considered necessary by your doctor.

You should not stop your treatment without discussing this with your doctor. A risk of birth defects for your unborn child cannot be completely excluded. Keppra has shown unwanted reproductive effects in animal studies.

Breast-feeding is not recommended during treatment with Keppra. The ingredients can pass into your breast milk. Talk to your doctor about this.

Driving and using machines

Keppra can make you feel drowsy or sleepy and have other side effects that make you less alert. This is more likely at the beginning of treatment or after an increase in the dose.

→ **Don't drive or use machines** unless you are sure you're not affected.

Keppra 750mg film-coated tablets contain sunset yellow FCF (E110)

Sunset Yellow FCF (E110) colouring agent may cause allergic reactions.

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3. How to take Keppra

How much to take

Always take Keppra exactly as your doctor has told you to. Check with your doctor or pharmacist if you're not sure.

Take [the tablets/ the oral solution](#) following your doctor's instructions.

Keppra must be taken **twice a day**, once in the morning and once in the evening, at about the same time each day.

Monotherapy

❖ **Monotherapy in adults and adolescents (from 16 years of age)**

— **Keppra film-coated tablets**

When you will first start taking Keppra, your doctor will prescribe you a **lower dose** during first 2 weeks of treatment, before giving you the lowest general dose.

The usual starting dose of Keppra is **250 mg twice daily**. Your doctor will increase your dose to **500 mg, twice daily** after two weeks of treatment.

Your doctor may decide to further increase your dose to a maximum of **1500 mg, twice daily** - depending on how you respond to the medicine.

— **Keppra 100 mg/ml oral solution**

Measure the appropriate dosage using the syringe included in the package.

→ Ask your doctor or pharmacist if you have any questions on how to measure your dose accurately.

When you will first start taking Keppra, your doctor will prescribe you a **lower dose** during first 2 weeks of treatment (usually 2.5 ml (250 mg) twice daily), before giving you the lowest general dose.

General dose: Keppra is taken **twice daily**, in two equally divided doses, each individual dose being measured between **5 ml (500mg) and maximum of 15 ml (1500mg)**.

Add-on therapy

❖ **Add-on therapy in adults and adolescents (12 to 17 years) weighing 50 kg or more**

— **Keppra film-coated tablets**

The usual starting dose of Keppra is **500 mg twice daily**. Your doctor may decide to gradually increase your dose to a maximum of **1500 mg, twice daily** - depending on how you respond to the medicine.

— **Keppra 100 mg/ml oral solution**

Measure the appropriate dosage using the syringe included in the package.

→ Ask your doctor or pharmacist if you have any questions on how to measure your dose accurately.

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The usual starting dose of Keppra is 5 ml (500mg) twice daily.

General dose: Keppra is taken **twice daily**, in two equally divided doses, each individual dose being measured between **5 ml (500mg) and 15 ml (1500mg)**.

❖ **Add-on therapy in children 6 months and older**

Keppra oral solution is the preferred formulation for use in infants and children **under the age of 6 years**.

Measure the appropriate dosage using the syringe size as advised by your doctor.

→ Ask your doctor or pharmacist if you have any questions on how to measure the dose accurately.

General dose: Keppra is taken twice daily, in two equally divided doses, each individual dose being measured between 0.1 ml (10mg) and 0.3 ml (30mg), per kg bodyweight of the child (see table below for dose examples).

Dose in children 6 months and older

Weight	Starting dose: 0.1 ml/kg twice daily	Maximum dose: 0.3 ml/kg twice daily
6 kg	0.6 ml twice daily	1.8 ml twice daily
8 kg	0.8 ml twice daily	2.4 ml twice daily
10 kg	1 ml twice daily	3 ml twice daily
15 kg	1.5 ml twice daily	4.5 ml twice daily
20 kg	2 ml twice daily	6 ml twice daily
25 kg	2.5 ml twice daily	7.5 ml twice daily
From 50 kg	5 ml twice daily	15 ml twice daily

❖ **Add-on therapy in infants (1 month to less than 6 months)**

Measure the appropriate dosage using the syringe size as advised by your doctor.

→ Ask your doctor or pharmacist if you have any questions on how to measure the dose accurately.

General dose: Keppra is taken twice daily, in two equally divided doses, each individual dose being measured between 0.07 ml (7mg) and 0.21 ml (21mg), per kg bodyweight of the infant. (see table below for dose examples).

Dose in infants (1 month to less than 6 months):

Weight	Starting dose: 0.07 ml/kg twice daily	Maximum dose: 0.21 ml/kg twice daily
4 kg	0.3 ml twice daily	0.85 ml twice daily
5 kg	0.35 ml twice daily	1.05 ml twice daily
6 kg	0.45 ml twice daily	1.25 ml twice daily
7 kg	0.5 ml twice daily	1.5 ml twice daily

Patients with kidney problems

Your doctor will decide on the correct dose of Keppra for you/your child depending on kidney function and the body weight.

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How to take

Film-coated tablets

Swallow Keppra tablet(s) with a sufficient quantity of liquid (for example a glass of water). You can take Keppra with or without food. After oral administration the bitter taste of levetiracetam may be experienced.

Oral solution

After measuring the correct dose with an appropriate syringe, Keppra oral solution may be diluted in a glass of water or baby's bottle and can be taken with or without food. After oral administration the bitter taste of levetiracetam may be experienced.

Take the oral solution following your doctor's instructions.

A dosing [oral syringe](#) with a [10] ml graduation is supplied with the pack so you can measure your dose accurately.

→ **If you are not supplied with [\[an oral syringe\]](#)** speak to your doctor or pharmacist.

If you forget to take Keppra

Don't take an extra dose to make up for a missed dose. Contact your doctor if you have missed one or more doses.

If you take too much Keppra

If you take more Keppra than you should you may be **more likely to feel drowsy, agitated or have other side effects such as decrease of alertness, aggression, shallow breathing and loss of consciousness (coma)**.

→ **Don't delay. Contact your doctor or your nearest hospital emergency department immediately.** If possible, show them the Keppra pack.

Don't stop Keppra without advice

Take Keppra for as long as your doctor recommends. Don't stop unless your doctor advises you to. If you are suffering from epilepsy abruptly stopping your medicine may increase your fits (*seizures*).

If stopping treatment, Keppra should be discontinued gradually. Your doctor will instruct you about the gradual withdrawal of Keppra.

→ Ask your doctor or pharmacist if you have any questions on the use of this product.

4. Possible side effects

Like all medicines, Keppra can cause side effects, but not everybody gets them.

Conditions you need to look out for

Severe allergic reactions. These are rare in people taking Keppra. Signs include:

- raised and itchy rash (hives)
- swelling, sometimes of the face or mouth (*angioedema*), causing difficulty in breathing

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- collapse or loss of consciousness

Serious skin reactions. These are rare in people taking Keppra. Signs include:

- skin rash, which may blister, and looks like small targets (central dark spots surrounded by a paler area, with a dark ring around the edge - *erythema multiforme*)
- a widespread rash with blisters and peeling skin, particularly around the mouth, nose, eyes and genitals (*Stevens Johnson Syndrome*)
- extensive peeling of the skin on much of the body surface – (*toxic epidermal necrolysis*)

Drug Reaction with Eosinophilia and Systemic Symptoms (DRESS). These are rare in people taking Keppra. Signs include:

- flu-like symptoms and a rash on the face followed by an extended rash with a high temperature
- enlarged lymph nodes and the involvement of other body organs
- increased levels of liver enzymes seen in blood tests and an increase in a type of white blood cell (*eosinophilia*)

Sudden decrease of kidney function. This is rare in people taking Keppra. Signs include:

- low urine volume
- tiredness, nausea, vomiting
- confusion
- swelling in the legs, ankles or feet

Encephalopathy (degenerative disease of the brain). This generally occur at the beginning of the treatment (few days to a few months) in people taking Keppra. Signs include:

- serious mental changes or signs of confusion
- feeling drowsy (somnolence)
- loss of memory (amnesia), memory impairment (forgetfulness)
- abnormal behaviour
- other neurological signs including involuntary or uncontrolled movements

Depression. This is common in people taking Keppra.

Suicidal thoughts. These are uncommon in people taking Keppra.

→ **Get medical help immediately** if you get these symptoms.

Very common side effects

These may affect **more than 1 in 10** people:

- inflammation of the nasopharynx (*nasopharyngitis*)
- feeling drowsy (*somnolence*)
- headache

Common side effects

These may affect **up to 1 in 10** people:

- loss of appetite (*anorexia*) - especially if you take another drug called topiramate
- depression, hostility or aggression, anxiety, difficulty in sleeping, nervousness or irritability
- fits (*seizures*), balance disorder, dizziness, abnormal drowsiness (*lethargy*), tremor
- spinning sensation (*vertigo*)
- cough

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- stomach pain, diarrhoea, indigestion, vomiting, feeling sick (*nausea*)
- rash
- feeling weak or lack of energy

Uncommon side effects

These may affect **up to 1 in 100** people:

- decreased or increased weight
- suicide attempt and suicidal ideation, mental disorder, abnormal behaviour, seeing or hearing things that are not really there (hallucination), anger, confusion, panic attack, emotional instability/mood swings, agitation;
- loss of memory, memory impairment (forgetfulness), abnormal coordination or loss of coordinated bodily movements, tingling or numbness of the hands or feet, disturbance in attention (loss of concentration)
- double vision, blurred vision
- unusual hair loss or thinning, eczema, itching
- muscle weakness, muscle pain
- injury

Uncommon side effects that may show up in blood tests:

- decrease in number of blood platelets - cells that help blood to clot (*thrombocytopenia*)
- decrease in the number of white blood cells (*leucopenia*)
- elevated/abnormal values in a liver function test

Rare side effects

These may affect **up to 1 in 1,000** people:

- infection
- allergic reactions (see 'Severe allergic reactions' earlier in Section 4)
- drug-induced hypersensitivity reaction that includes fever, rash, and blood abnormalities (see Drug Reaction with Eosinophilia and Systemic Symptoms (DRESS) earlier in Section 4)
- suicide, personality disorders (behavioural problems), abnormal thinking, severe confusion (delirium)
- uncontrollable muscle spasms affecting the eyes, head, neck and body, uncontrollable movements, hyperactivity (unusually overactive),
- encephalopathy (degenerative disease of the brain) (see 'encephalopathy' earlier in Section 4)
- seizures may become worse or happen more often
- disturbance in heart rhythm (electrocardiogram)
- inflammation of the pancreas
- liver failure, inflammation of the liver
- erythema multiforme, Stevens Johnson Syndrome, toxic epidermal necrolysis (see 'Serious skin reactions' earlier in Section 4)
- acute kidney injury (see 'Sudden decrease of kidney function' earlier in Section 4)
- rhabdomyolysis (breakdown of muscle tissue) and associated blood creatine phosphokinase increase. Prevalence is significantly higher in Japanese patients when compared to non-Japanese patients
- limp or difficulty walking

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- combination of fever, muscle stiffness, unstable blood pressure and heart rate, confusion, low level of consciousness (may be signs of a disorder called neuroleptic malignant syndrome). Prevalence is significantly higher in Japanese patients when compared to non-Japanese patients.

Rare side effects that may show up in blood tests:

- decrease in number of all types blood cells
- decrease in sodium in the blood

Very rare side effects

These may affect **up to 1 in 10000** people

- repeated unwanted thoughts or sensations or the urge to do something over and over again (Obsessive Compulsive Disorder).

→ **Tell your doctor or pharmacist** if any of the side effects listed becomes **severe or troublesome**, or if you notice any side effects not listed in this leaflet.

5. How to store KEPPRA

Keep out of the sight and reach of children.

Don't take Keppra after the expiry date shown on the pack.

Store in original packaging Don't store **Keppra** above 30°C.

Don't dispose of medicines in wastewater or household waste. Ask your pharmacist how to dispose of medicines no longer required. This will help to protect the environment.

6. Further information

What Keppra contains

The active substance is levetiracetam.

Each film-coated tablet contains [250] mg or [750] of levetiracetam.

Each 1 ml of oral solution contains 100 mg of levetiracetam.

The other ingredients are:

Keppra, film-coated tablets: Sodium croscarmellose, Macrogol, Colloidal Anhydrous silica, Magnesium stearate, Opadry film coating

Keppra 100 mg/mL Oral Solution: Sodium citrate, Citric acid monohydrate, Methyl parahydroxybenzoate, Propyl parahydroxybenzoate, Ammonium glycyrrhizate, Glycerol, Maltitol liquid, Acesulfame potassium, Grape flavor Firmenich

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What Keppra looks like and contents of the pack

Keppra, 250 mg, film-coated tablets Blue, oblong film-coated tablet scored and debossed with the code ucb and 250 on one side. The score line is only to facilitate breaking for ease of swallowing and not to divide into equal doses. **Keppra, 750 mg, film-coated tablets** Orange, oblong film-coated tablet scored and debossed with the code ucb and 750 on one side. The score line is only to facilitate breaking for ease of swallowing and not to divide into equal doses.

Keppra 250mg and 750mg film-coated tablets are packaged in Aluminium/PVC blisters placed into cardboard boxes containing 60 tablets.

Keppra Oral solution 100 mg/mL is packed in a 300 mL type III amber glass bottle with a polypropylene white child-resistant closure system

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Keppra Tablets Manufactured by:

UCB Pharma SA, Chemin du Foriest, 1420 Braine-I'Alleud, Belgium.

Keppra Oral Solution is Manufactured by:

NextPharma SAS,
17,Route de Meulan, F-78520 Limay, France

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To report any Adverse events, please contact: pm.safety@gsk.com

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