

# Tramal Injection 100

## 1. Name of the medicinal product

**Tramal Injection 100** Solution for Injection

## 2. Qualitative and quantitative composition

Each Tramal Injection 100 ampoule contains 100mg tramadol hydrochloride in 2ml colourless aqueous solution.

Excipient with known effect: This medicine contains less than 1 mmol sodium (23 mg) per 2mL, that is to say essentially 'sodium-free'.

For the full list of excipients, see Section 6.1.

## 3. Pharmaceutical form

Solution for injection.

## 4. Clinical particulars

### 4.1 Therapeutic indications

Moderate to severe pain

### 4.2 Posology and method of administration

Prior to starting treatment with opioids, a discussion should be held with patients to put in place a strategy for ending treatment with tramadol in order to minimise the risk of addiction and drug withdrawal syndrome (see section 4.4).

The injection is for parenteral administration either intramuscularly, by slow intravenous injection or, when diluted in solution, by infusion or patient controlled analgesia. As with all analgesic drugs the dosing of Tramal Injection 100 should be adjusted depending on the severity of the pain and the individual clinical response of the patient.

#### *Adults:*

A single dose of 50 or 100 mg 4-6 hourly (1 or 2 ml of Tramal Injection 100) is usually required. Intravenous injections must be given slowly over 2-3 minutes.

In severe (post-operative) pain, an initial bolus of 100 mg is administered 10-20 minutes up to a total dose of 250 mg including the initial bolus.

Subsequent doses should be 50 or 100 mg administered 4-6 hourly.

If the administration of Tramal Injection 100 has been forgotten, the pain may return. The dose should not be doubled. Administration should be continued as before.

A total daily dose of 400 mg should not be exceeded except in special clinical circumstances.

Tramal Injection 100 is injected into the veins (usually into a blood vessel under the surface of the arm), muscles (usually the buttocks) or under the skin. Administration into the veins is slow with 1 ml Tramal Injection 100, solution for injection (equivalent to 50 mg tramadol hydrochloride) per minute. Alternatively Tramal injection may be diluted with a suitable infusion solution (e.g. 0.9% physiological saline or 5% glucose solution) for i.v. infusion or for patient-controlled analgesia (PCA).

*Elderly patients:*

Dosing as for adults but it should be noted that in a study in elderly volunteers (aged over 75 years) the elimination half-life for orally administered tramadol was increased by 17%.

*Patients with renal insufficiency/renal dialysis:*

As the elimination of tramadol may be prolonged in patients with renal impairment, the usual initial adult doses should be employed, but prolongation of the dosage interval should be carefully considered according to the patient's requirements. For creatinine clearance <30 ml/min the dosing should be increased to 12 hourly intervals.

For creatinine clearance <10 ml/min (severe renal impairment) tramadol is not recommended.

Tramadol is removed very slowly by haemodialysis or haemofiltration and therefore post dialysis dosing to maintain analgesia is usually unnecessary.

*Patients with hepatic insufficiency:*

It should be noted that as the elimination of tramadol may be prolonged in severe hepatic impairment, although the usual initial adult doses should be used, prolongation of the dosing should be at 12 hourly intervals.

*Children: Over 14 years:* Dosage as for adults.

*Children aged 1 to 14 years:*

Receive 1-2 mg tramadol hydrochloride per kg body weight as a single dose. In this case Tramal Injection 100 is diluted in water for injection. The following table shows which concentrations are achieved (1 ml Tramal Injection 100 contains 50 mg tramadol hydrochloride):

Diluting Tramal Injection 100

In water for Injections	Gives the following concentrations:	In water for injections	Gives the following concentrations:
2 ml + 2 ml	25.0 mg/ml	2 ml + 12 ml	7.1 mg/ml
2 ml + 4 ml	16.7 mg/ml	2 ml + 14 ml	6.3 mg/ml
2 ml + 6 ml	12.5 mg/ml	2 ml + 16 ml	5.6 mg/ml
2 ml + 8 ml	10.0 mg/ml	2 ml + 18 ml	5.0 mg/ml
2 ml + 10 ml	8.3 mg/ml		

Example: the doctor would like to give 1.5 mg tramadol hydrochloride per kg body weight to a child weighing 45 kg. This requires 67.5 mg tramadol hydrochloride. Therefore 2 ml Tramal Injection 100 are diluted in 4 ml water for injection. This results in a concentration of 16.7 mg tramadol hydrochloride per ml. 4 ml (approx. 67 mg tramadol hydrochloride) of the diluted solution are then administered.

If you interrupt or stop treatment with Tramal Injection 100 too soon, pain is likely to return. In general stopping treatment with Tramal Injection 100 will have no after-effects. However, in some patients given Tramal Injection 100 for a very long time and then stopped suddenly, after-effects may occur. The patients might feel restless, anxious, nervous or dithery. They might be overactive, sleep badly, or have stomach or bowel trouble. A very small number of people might have panic attacks, hallucinations, abnormal sensations such as tingling and numbness, or ringing in the ears (tinnitus).

**Method of administration**

The solution for injection is to be injected slowly or diluted in infusion solution and infused.

For instructions on dilution of the medicinal product before administration, see section 6.6.

**Duration of administration**

Tramal Injection 100 should under no circumstances be administered for longer than absolutely necessary. If long-term pain treatment with tramadol is necessary in view of the nature and severity of the illness, then careful and regular monitoring should be carried out (if necessary with breaks in treatment) to establish whether and to what extent further

treatment is necessary.

### 4.3 Contraindications

Tramal Injection 100 is contraindicated

- in hypersensitivity to tramadol or any of the excipients listed in section 6.1;
- in acute intoxication with alcohol, hypnotics, analgesics, opioids, or other psychotropic medicinal products;
- in patients who are receiving MAO inhibitors or who have taken them within the last 14 days (see section 4.5);
- in patients with epilepsy not adequately controlled by treatment;
- for use in narcotic withdrawal treatment.

### 4.4 Special warnings and precautions for use

Tramadol may only be used with particular caution in opioid-dependent patients, patients with head injury, shock, a reduced level of consciousness of uncertain origin, disorders of the respiratory center or function, increased intracranial pressure.

In patients sensitive to opiates tramadol should only be used with caution.

Concomitant use of Tramal Injection 100 and sedating medicinal products such as benzodiazepines or related substances, may result in sedation, respiratory depression, coma and death. Because of these risks, concomitant prescribing with these sedating medicinal products should be reserved for patients for whom alternative treatment options are not possible. If a decision is made to prescribe Tramal Injection 100 concomitantly with sedating medicinal products, the lowest effective dose of Tramal Injection 100 should be used, and the duration of the concomitant treatment should be as short as possible. The patients should be followed closely for signs and symptoms of respiratory depression and sedation. In this respect, it is strongly recommended to inform patients and their caregivers to be aware of these symptoms (see section 4.5).

Care should be taken when treating patients with respiratory depression, or if concomitant CNS depressant drugs are being administered (see section 4.5), or if the recommended dosage is significantly exceeded (see section 4.9) as the possibility of respiratory depression cannot be excluded in these situations.

#### Sleep-related breathing disorders

Opioids can cause sleep-related breathing disorders including central sleep apnea (CSA) and sleep-related hypoxemia. Opioid use increases the risk of CSA in a dose-dependent fashion. In patients who present with CSA, consider decreasing the total opioid dosage.

Convulsions have been reported in patients receiving tramadol at the recommended dose levels. The risk may be increased when doses of tramadol exceed the recommended upper daily dose limit (400 mg). In addition, tramadol may increase the seizure risk in patients taking other medicinal products that lowers the seizure threshold (see section 4.5).

Patients with epilepsy or those susceptible to seizures should only be treated with tramadol if there are compelling circumstances

#### Serotonin syndrome

Serotonin syndrome, a potentially life-threatening condition, has been reported in patients receiving tramadol in combination with other serotonergic agents or tramadol alone (see sections 4.5, 4.8 and 4.9).

If concomitant treatment with other serotonergic agents is clinically warranted, careful observation of the patient is advised, particularly during treatment initiation and dose escalations.

Symptoms of serotonin syndrome may include mental status changes, autonomic instability, neuromuscular abnormalities and/or gastrointestinal symptoms.

Serotonin syndrome is likely when one of the following is observed:

Spontaneous clonus

Inducible or ocular clonus with agitation or diaphoresis

Tremor and hyperreflexia

Hypertonia and body temperature  $> 38\text{ }^{\circ}\text{C}$  and inducible or ocular clonus

If serotonin syndrome is suspected, a dose reduction or discontinuation of therapy should be considered depending on the severity of the symptoms. Withdrawal of the serotonergic drugs usually brings about a rapid improvement.

Drug dependence, tolerance and potential for abuse

For all patients, prolonged use of this product may lead to drug dependence (addiction), even at therapeutic doses. The risks are increased in individuals with current or past history of substance misuse disorder (including alcohol misuse) or mental health disorder (e.g., major depression). Additional support and monitoring may be necessary when prescribing for patients at risk of opioid misuse.

A comprehensive patient history should be taken to document concomitant medications, including over-the-counter medicines and medicines obtained on-line, and past and present medical and psychiatric conditions.

Patients may find that treatment is less effective with chronic use and express a need to increase the dose to obtain the same level of pain control as initially experienced. Patients may also supplement their treatment with additional pain relievers. These could be signs that the patient is developing tolerance.

The risks of developing tolerance should be explained to the patient.

Overuse or misuse may result in overdose and/or death. It is important that patients only use medicines that are prescribed for them at the dose they have been prescribed and do not give this medicine to anyone else.

Patients should be closely monitored for signs of misuse, abuse, or addiction.

The clinical need for analgesic treatment should be reviewed regularly.

Drug withdrawal syndrome

Prior to starting treatment with any opioids, a discussion should be held with patients to put in place a withdrawal strategy for ending treatment with tramadol.

Drug withdrawal syndrome may occur upon abrupt cessation of therapy or dose reduction. When a patient no longer requires therapy, it is advisable to taper the dose gradually to minimise symptoms of withdrawal. Tapering from a high dose may take weeks to months.

The opioid drug withdrawal syndrome is characterised by some or all of the following: restlessness, lacrimation, rhinorrhoea, yawning, perspiration, chills, myalgia, mydriasis and palpitations. Other symptoms may also develop including irritability, agitation, anxiety, hyperkinesia, tremor, weakness, insomnia, anorexia, abdominal cramps, nausea, vomiting, diarrhoea, increased blood pressure, increased respiratory rate or heart rate.

If women take this drug during pregnancy, there is a risk that their newborn infants will experience neonatal withdrawal syndrome.

Tramadol is not suitable as a substitute in opioid-dependent patients. Although it is an opioid agonist, tramadol cannot suppress morphine withdrawal symptoms

Hyperalgesia

Hyperalgesia may be diagnosed if the patient on long-term opioid therapy presents with increased pain.

This might be qualitatively and anatomically distinct from pain related to disease progression or to breakthrough pain resulting from development of opioid tolerance. Pain associated with hyperalgesia tends to be more diffuse than the pre-existing pain and less defined in quality. Symptoms of hyperalgesia may resolve with a reduction of opioid dose..

## CYP2D6 metabolism

Tramadol is metabolised by the liver enzyme CYP2D6. If a patient has a deficiency or is completely lacking this enzyme an adequate analgesic effect may not be obtained. Estimates indicate that up to 7% of the Caucasian population may have this deficiency. However, if the patient is an ultra-rapid metaboliser there is a risk of developing side effects of opioid toxicity even at commonly prescribed doses.

General symptoms of opioid toxicity include confusion, somnolence, shallow breathing, small pupils, nausea, vomiting, constipation and lack of appetite. In severe cases this may include symptoms of circulatory and respiratory depression, which may be life threatening and very rarely fatal. Estimates of prevalence of ultra-rapid metabolisers in different populations are summarised below:

Population	Prevalence %
African/Ethiopian	29%
African American	3.4% to 6.5%
Asian	1.2% to 2%
Caucasian	3.6% to 6.5%
Greek	6.0%
Hungarian	1.9%
Northern European	1% to 2%

## Post-operative use in children

There have been reports in the published literature that tramadol given post-operatively in children after tonsillectomy and/or adenoidectomy for obstructive sleep apnoea, led to rare, but life threatening adverse events. Extreme caution should be exercised when tramadol is administered to children for post-operative pain relief and should be accompanied by close monitoring for symptoms of opioid toxicity including respiratory depression.

## Children with compromised respiratory function

Tramadol is not recommended for use in children in whom respiratory function might be compromised including neuromuscular disorders, severe cardiac or respiratory conditions, upper respiratory or lung infections, multiple trauma or extensive surgical procedures. These factors may worsen symptoms of opioid toxicity.

### Adrenal insufficiency

Opioid analgesics may occasionally cause reversible adrenal insufficiency requiring monitoring and glucocorticoid replacement therapy. Symptoms of acute or chronic adrenal insufficiency may include e.g. severe abdominal pain, nausea and vomiting, low blood pressure, extreme fatigue, decreased appetite, and weight loss.

## 4.5 Interaction with other medicinal products and other forms of interaction

Tramadol should not be combined with MAO inhibitors (see section 4.3).

In patients treated with MAO inhibitors in the 14 days prior to the use of the opioid pethidine, life-threatening interactions on the central nervous system, respiratory and cardiovascular function have been observed. The same interactions with MAO inhibitors cannot be ruled out during treatment with tramadol.

Concomitant administration of tramadol with other centrally depressant medicinal products including alcohol may potentiate the CNS effects (see section 4.8).

The concomitant use of opioids with sedating medicinal products such as benzodiazepines or related substances increases the risk of sedation, respiratory depression, coma and death because of additive CNS depressant effect. The dose of Tramadol Injection 100 and the duration of the concomitant use should be limited (see section 4.4)

The results of pharmacokinetic studies have so far shown that on the concomitant or previous administration of cimetidine (enzyme inhibitor) clinically relevant interactions are unlikely to occur. Simultaneous or previous administration of carbamazepine (enzyme inducer) may reduce the analgesic effect and shorten the duration of action.

Tramadol can induce convulsions and increase the potential for selective serotonin re-uptake inhibitors (SSRIs), serotonin norepinephrine reuptake inhibitors (SNRIs), tricyclic antidepressants, antipsychotics and other seizure threshold-lowering medicinal products (such as bupropion, mirtazapine, tetrahydrocannabinol) to cause convulsions.

Concomitant therapeutic use of tramadol and serotonergic drugs, such as selective serotonin reuptake inhibitors (SSRIs), serotonin-norepinephrine reuptake inhibitors (SNRIs), MAO inhibitors (see section 4.3), tricyclic antidepressants and mirtazapine may cause serotonin syndrome, a potentially life-threatening condition (see sections 4.4 and 4.8)

Caution should be exercised during concomitant treatment with tramadol and coumarin derivatives (e.g. warfarin) due to reports of increased INR with major bleeding and ecchymoses in some patients.

Other active substances known to inhibit CYP3A4, such as ketoconazole and erythromycin, might inhibit the metabolism of tramadol (N-demethylation) probably also the metabolism of the active O-demethylated metabolite. The clinical importance of such an interaction has not been studied (see section 4.8).

In a limited number of studies the pre- or postoperative application of the antiemetic 5-HT<sub>3</sub> antagonist ondansetron increased the requirement of tramadol in patients with postoperative pain.

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

##### Pregnancy

Animal studies with tramadol revealed at very high doses effects on organ development, ossification and neonatal mortality. Tramadol crosses the placenta. There is inadequate evidence available on the safety of tramadol in human pregnancy. Therefore tramadol should not be used in pregnant women.

Regular use during pregnancy may cause drug dependence in the foetus, leading to withdrawal symptoms in the neonate.

If opioid use is required for a prolonged period in a pregnant woman, advise the patient of the risk of neonatal opioid withdrawal syndrome and ensure that appropriate treatment will be available.

Tramadol - administered before or during birth - does not affect uterine contractility. Administration during labour may depress respiration in the neonate and an antidote for the child should be readily available.

##### Breast-feeding

Administration to nursing women is not recommended as tramadol may be secreted in breast milk and may cause respiratory depression in the infant.

##### Fertility

Post marketing surveillance does not suggest an effect of tramadol on fertility. Animal studies did not show an effect of tramadol on fertility.

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

Even when taken according to instructions, tramadol may cause effects such as somnolence and dizziness and therefore may impair the reactions of drivers and machine operators. This applies particularly in conjunction with other psychotropic substances, particularly alcohol.

This medicine can impair cognitive function and can affect a patient's ability to drive safely. When prescribing this medicine, patients should be told:

- The medicine is likely to affect your ability to drive
- Do not drive until you know how the medicine affects you

#### **4.8 Undesirable effects**

Rapid intravenous administration may be associated with a higher incidence of adverse effects and therefore should be avoided.

The most commonly reported adverse reactions are nausea and dizziness, both occurring in more than 10 % of patients.

The frequencies are defined as follows:

*Very common:*  $\geq 1/10$

*Common:*  $\geq 1/100$ ,  $< 1/10$

*Uncommon:*  $\geq 1/1000$ ,  $< 1/100$

*Rare:*  $\geq 1/10\ 000$ ,  $< 1/1000$

*Very rare:*  $< 1/10\ 000$

*Not known:* cannot be estimated from the available data

*Cardiac disorders:*

*Uncommon:* cardiovascular regulation (palpitation, tachycardia,). These adverse reactions may occur especially on intravenous administration and in patients who are physically stressed.

*Rare:* bradycardia

*Investigations:*

*Rare:* increase in blood pressure

*Vascular disorders:*

*Uncommon:* cardiovascular regulation (postural hypotension or cardiovascular collapse). These adverse reactions may occur especially on intravenous administration and in patients who are physically stressed.

*Metabolism and nutrition disorders:*

*Rare:* changes in appetite

*Respiratory, thoracic and mediastinal disorders:*

*Rare:* respiratory depression, dyspnoea

If the recommended doses are considerably exceeded and other centrally depressant substances are administered concomitantly (see section 4.5), respiratory depression may occur.

Worsening of asthma has been reported, though a causal relationship has not been established.

*Not known:* hiccups

*Nervous system disorders:*

*Very common:* dizziness

*Common:* headache, somnolence

*Rare:* changes in appetite, paraesthesia, tremor, respiratory depression, epileptiform convulsions, involuntary muscle contractions, abnormal coordination, syncope.

*Not known:* Serotonin syndrome

Convulsions occurred mainly after administration of high doses of tramadol or after concomitant treatment with medicinal products which can lower the seizure threshold (see sections 4.4 and 4.5).

*Psychiatric disorders:*

*Rare:* hallucinations, confusion, sleep disturbance, delirium, anxiety and nightmares. Psychic adverse reactions may occur following administration of tramadol which vary individually in intensity and nature (depending on personality and duration of treatment). These include changes in mood (usually elation, occasionally dysphoria), changes in activity (usually suppression, occasionally increase) and changes in cognitive and sensorial capacity (e.g. decision behaviour, perception disorders).

*Frequency unknown:* drug dependence (see section 4.4)

*Eye disorders*

*Rare:* miosis, myriasis, blurred vision

*Gastrointestinal disorders:*

*Very common:* nausea

*Common:* constipation, dry mouth, vomiting

*Uncommon:* retching; gastrointestinal discomfort (a feeling of pressure in the stomach, bloating), diarrhea

*Skin and subcutaneous tissue disorders:*

*Common:* hyperhidrosis

*Uncommon:* dermal reactions (e.g. pruritus, rash, urticaria)

*Musculoskeletal and connective tissue disorders:*

*Rare:* motorial weakness

*Hepatobiliary disorders:*

In a few isolated cases an increase in liver enzyme values has been reported in a temporal connection with the therapeutic use of tramadol.

*Renal and urinary disorders:*

*Rare:* micturition disorders (dysuria and urinary retention)

*Immune system disorders:*

*Rare:* allergic reactions (e.g. dyspnoea, bronchospasm, wheezing, angioneurotic oedema) and anaphylaxis

*Metabolism and nutrition disorders:*

*Not known:* hypoglycaemia

*General disorders and administration site conditions:*

*Common:* fatigue

*Uncommon:* drug withdrawal syndrome.

Symptoms of drug withdrawal syndrome, similar to those occurring during opiate withdrawal, may occur as follows: agitation, anxiety, nervousness, insomnia, hyperkinesia, tremor and gastrointestinal symptoms. Other symptoms that have very rarely been seen with tramadol discontinuation include: panic attacks, severe anxiety, hallucinations, paraesthesias, tinnitus and unusual CNS symptoms (i.e. confusion, delusions, depersonalisation, derealisation, paranoia).

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

Reporting suspected adverse reactions after authorisation of the medicinal product is important. It allows continued monitoring of the benefit/risk balance of the medicinal product. Any suspected adverse events should be reported to the Ministry of Health according to the National Regulation by using an online form

<https://sideeffects.health.gov.il/>.

#### **4.9 Overdose**

*Patients should be informed of the signs and symptoms of overdose and to ensure that family and friends are also aware of these signs and to seek immediate medical help if they occur.*

*Symptoms*

In principle, on intoxication with tramadol symptoms similar to those of other centrally acting analgesics (opioids) are to be expected. These include in particular miosis, vomiting, cardiovascular collapse, consciousness disorders up to coma, convulsions and respiratory depression up to respiratory arrest.

Serotonin syndrome has also been reported.

*Treatment*

The general emergency measures apply. Keep open the respiratory tract (aspiration!), maintain respiration and



circulation depending on the symptoms. The antidote for respiratory depression is naloxone. In animal experiments naloxone had no effect on convulsions. In such cases diazepam should be given intravenously.

In case of intoxication orally, gastrointestinal decontamination with activated charcoal or by gastric lavage is only recommended within 2 hours after tramadol intake. Gastrointestinal decontamination at a later time point may be useful in case of intoxication with exceptionally large quantities.

Tramadol is minimally eliminated from the serum by haemodialysis or haemo-filtration. Therefore treatment of acute intoxication with tramadol with haemodialysis or haemofiltration alone is not suitable for detoxification.

## 5. Pharmacological properties

### 5.1 Pharmacodynamic properties

Pharmacotherapeutic group: other opioids; ATC code: N02 AX02

Tramadol is a centrally acting opioid analgesic. It is a non-selective pure agonist at  $\mu$ ,  $\delta$  and  $\kappa$  opioid receptors with a higher affinity for the  $\mu$  receptor. Other mechanisms which contribute to its analgesic effect are inhibition of neuronal reuptake of noradrenaline and enhancement of serotonin release.

Tramadol has an antitussive effect. In contrast to morphine, analgesic doses of tramadol over a wide range have no respiratory depressant effect. Also gastrointestinal motility is less affected. Effects on the cardiovascular system tend to be slight. The potency of tramadol is reported to be 1/10 (one tenth) to 1/6 (one sixth) that of morphine.

#### Paediatric population

Effects of enteral and parenteral administration of tramadol have been investigated in clinical trials involving more than 2000 paediatric patients ranging in age from neonate to 17 years of age. The indications for pain treatment studied in those trials included pain after surgery (mainly abdominal), after surgical tooth extractions, due to fractures, burns and traumas as well as other painful conditions likely to require analgesic treatment for at least 7 days.

At single doses of up to 2 mg/kg or multiple doses of up to 8 mg/kg per day (to a maximum of 400 mg per day) efficacy of tramadol was found to be superior to placebo, and superior or equal to paracetamol, nalbuphine, pethidine or low dose morphine. The conducted trials confirmed the efficacy of tramadol. The safety profile of tramadol was similar in adult and paediatric patients older than 1 year (see section 4.2).

### 5.2 Pharmacokinetic properties

More than 90% of tramadol is absorbed after oral administration. The mean absolute bioavailability is approximately 70 %, irrespective of the concomitant intake of food. The difference between absorbed and non-metabolised available tramadol is probably due to the low first-pass effect. The first-pass effect after oral administration is a maximum of 30 %.

Tramadol has a high tissue affinity ( $V_{d,\beta} = 203 \pm 40$  l). It has a plasma protein binding of about 20 %.

Following a single oral dose administration of tramadol 100 mg as capsules or tablets to young healthy volunteers, plasma concentrations were detectable within approximately 15 to 45 minutes within a mean  $C_{max}$  of 280 to 208 mcg/L and  $T_{max}$  of 1.6 to 2h.

Tramadol passes the blood-brain and placental barriers. Very small amounts of the substance and its O-desmethyl derivative are found in the breast-milk (0.1 % and 0.02 % respectively of the applied dose).

Elimination half-life  $t_{1/2,\beta}$  is approximately 6 h, irrespective of the mode of administration. In patients above 75 years of age it may be prolonged by a factor of approximately 1.4.

In humans tramadol is mainly metabolised by means of N- and O-demethylation and conjugation of the O-demethylation products with glucuronic acid. Only O-desmethyltramadol is pharmacologically active. There are considerable interindividual quantitative differences between the other metabolites. So far, eleven metabolites have been found in the

urine. Animal experiments have shown that O-desmethyltramadol is more potent than the parent substance by the factor 2 - 4. Its half-life  $t_{1/2,\beta}$  (6 healthy volunteers) is 7.9 h (range 5.4 - 9.6 h) and is approximately that of tramadol.

The inhibition of one or both types of the isoenzymes CYP3A4 and CYP2D6 involved in the biotransformation of tramadol may affect the plasma concentration of tramadol or its active metabolite.

Tramadol and its metabolites are almost completely excreted via the kidneys. Cumulative urinary excretion is 90 % of the total radioactivity of the administered dose. In cases of impaired hepatic and renal function the half-life may be slightly prolonged. In patients with cirrhosis of the liver, elimination half-lives of  $13.3 \pm 4.9$  h (tramadol) and  $18.5 \pm 9.4$  h (O-desmethyltramadol), in an extreme case 22.3 h and 36 h respectively, have been determined. In patients with renal insufficiency (creatinine clearance  $< 5$  ml/min) the values were  $11 \pm 3.2$  h and  $16.9 \pm 3$  h, in an extreme case 19.5 h and 43.2 h respectively.

Tramadol has a linear pharmacokinetic profile within the therapeutic dosage range.

The relationship between serum concentrations and the analgesic effect is dose-dependent, but varies considerably in isolated cases. A serum concentration of 100 - 300 ng/ml is usually effective.

#### Paediatric population

The pharmacokinetics of tramadol and O-desmethyltramadol after single-dose and multiple-dose oral administration to subjects aged 1 year to 16 years were found to be generally similar to those in adults when adjusting for dose by body weight, but with a higher between-subject variability in children aged 8 years and below.

In children below 1 year of age, the pharmacokinetics of tramadol and O-desmethyltramadol have been investigated, but have not been fully characterized. Information from studies including this age group indicates that the formation rate of O-desmethyltramadol via CYP2D6 increases continuously in neonates, and adult levels of CYP2D6 activity are assumed to be reached at about 1 year of age. In addition, immature glucuronidation systems and immature renal function may result in slow elimination and accumulation of O-desmethyltramadol in children under 1 year of age.

### **5.3 Preclinical safety data**

On repeated oral and parenteral administration of tramadol for 6 - 26 weeks in rats and dogs and oral administration for 12 months in dogs haematological, clinico-chemical and histological investigations showed no evidence of any substance-related changes. Central nervous manifestations only occurred after high doses considerably above the therapeutic range: restlessness, salivation, convulsions, and reduced weight gain. Rats and dogs tolerated oral doses of 20 mg/kg and 10 mg/kg body weight respectively, and dogs rectal doses of 20 mg/kg body weight without any reactions.

In rats tramadol dosages from 50 mg/kg/day upwards caused toxic effects in dams and raised neonate mortality. In the offspring retardation occurred in the form of ossification disorders and delayed vaginal and eye opening. Male fertility was not affected. After higher doses (from 50 mg/kg/day upwards) females exhibited a reduced pregnancy rate. In rabbits there were toxic effects in dams from 125 mg/kg upwards and skeletal anomalies in the offspring.

In some in-vitro test systems there was evidence of mutagenic effects. In-vivo studies showed no such effects. According to knowledge gained so far, tramadol can be classified as non-mutagenic.

Studies on the tumorigenic potential of tramadol hydrochloride have been carried out in rats and mice. The study in rats showed no evidence of any substance-related increase in the incidence of tumours. In the study in mice there was an increased incidence of liver cell adenomas in male animals (a dose-dependent, non-significant increase from 15 mg/kg upwards) and an increase in pulmonary tumours in females of all dosage groups (significant, but not dose-dependent).

## **6. Pharmaceutical particulars**

### **6.1 List of excipients**

Tramal Injection 100 ampoules contain  
water for injection  
sodium acetate

## **6.2 Incompatibilities**

Precipitation will occur if Tramal Injection 100 is mixed in the same syringe with injections of diazepam, diclofenac sodium, indomethacin, midazolam and piroxicam.

## **6.3 Shelf life**

The expiry date of the product is indicated on the packaging materials.

## **6.4 Special precautions for storage**

Do not store above 30°C.

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

Clear glass ampoules containing 2ml of tramadol hydrochloride in a box of 5 ampoules.

## **6.6 Special precautions for disposal and other handling**

Tramal Injection 100 is physically and chemically compatible for up to 24 hours with 4.2% sodium bicarbonate and Ringer's solution and for up to 5 days with the following infusion solutions:

0.9% sodium chloride

0.18% sodium chloride and 4% glucose

sodium lactate compound

5% glucose

haemaccel

## **7. Manufacturer**

Grunenthal GmbH Germany, Aachen, Germany

## **8. Marketing authorization holder**

Tec-O-Pharm Libra Ltd.

POB 45054, Jerusalem 9145016

## **9. Marketing authorization number(s)**

125-54-30477

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