

# NEW ZEALAND DATA SHEET

## 1. PRODUCT NAME

Arrow – Tramadol, capsules, 50 mg

## 2. QUALITATIVE AND QUANTITATIVE COMPOSITION

Each capsule contains 50 mg of tramadol hydrochloride.

Excipient with known effect: gelatin, methyl hydroxybenzoate, propyl hydroxybenzoate.

For the full list of excipients, see section 6.1.

## 3. PHARMACEUTICAL FORM

Green/yellow coloured hard gelatin capsules, size 3 filled with homogeneous white to off-white powder which contains 50 mg tramadol hydrochloride.

## 4. CLINICAL PARTICULARS

### 4.1 Therapeutic indications

Relief of moderate to severe pain.

### 4.2 Dose and method of administration

The dose of Arrow-Tramadol should be titrated to the severity of the pain and the clinical response of the individual patient.

#### *Adults*

Arrow-Tramadol is approved for use in adults, adolescents, and children over the age of 12 years.

For the treatment of moderate pain tramadol 50 to 100 mg administered two or three times daily may be sufficient. Arrow-Tramadol 50 mg may be adequate as the initial dose for moderate pain.

For moderate to severe pain, 50 to 100 mg as needed for relief, every four to six hours may be administered. Arrow-Tramadol 100mg is usually more effective as the initial dose for more severe pain.

The maximum daily dose should not exceed 400mg per day.

#### **Paediatric Population**

Arrow-Tramadol is approved for use in children 12 years old and over.

#### **Special Populations**

##### *Elderly*

In subjects over the age of 75 years, serum concentrations are slightly elevated and the elimination half-life is slightly prolonged. Subjects in this age group are also expected to vary more widely in their ability to tolerate adverse drug effects. Daily doses in excess of 300 mg are not recommended in patients over 75 years.

##### *Renal insufficiency*

In patients with renal and/or hepatic insufficiency the elimination of tramadol is delayed. In these patients prolongation of the dosage intervals should be carefully considered according to the patient's requirements.

##### *Hepatic insufficiency*

In hepatic impairment, the initial oral dose of tramadol is 50 mg of the immediate release formulation. Depending on the severity of the impairment and individual clinical response, the recommended dosage interval (4 to 6 hours) may require to be extended, and/or the dose level titrated as required.

### 4.3 Contraindications

Arrow-Tramadol is contraindicated in:

- children aged less than 12 years
- postoperative management of children younger than 18 years of age following tonsillectomy and/or adenoidectomy
- individuals with known hypersensitivity to tramadol or any excipients
- acute intoxication with alcohol, hypnotics, analgesics, opioids or psychotropic drugs
- patients who are taking MAO inhibitors or who have taken them within the last 14 days
- known hypersensitivity to opioids
- patients with uncontrolled epilepsy or epilepsy not adequately controlled by treatment.

Arrow-Tramadol must not be used for narcotic withdrawal treatment.

### 4.4 Special warnings and precautions for use

#### **Risk from concomitant use of sedative medicines such as benzodiazepines**

Profound sedation, respiratory depression, coma, and death may result from the concomitant use of Arrow-Tramadol with benzodiazepines or other CNS depressants (e.g., non-benzodiazepine sedatives/hypnotics, anxiolytics, tranquilizers, muscle relaxants, general anaesthetics, medicines with antihistamine-sedating actions such as antipsychotics, other opioids, alcohol). Because of these risks, reserve concomitant prescribing of these drugs for use in patients for whom alternative treatment options are inadequate.

Observational studies have demonstrated that concomitant use of opioid analgesics and benzodiazepines increases the risk of medicine-related mortality compared to use of opioid analgesics alone. Because of similar pharmacological properties, it is reasonable to expect similar risk with the concomitant use of other CNS depressant drugs with opioid analgesics (see Section 4.5 Interactions with other medicines and other forms of interaction).

If the decision is made to prescribe a benzodiazepine or other CNS depressant concomitantly with an opioid analgesic, prescribe the lowest effective dosages and minimum durations of concomitant use. In patients already receiving an opioid analgesic, prescribe a lower initial dose of the benzodiazepine or other CNS depressant than indicated in the absence of an opioid, and titrate based on clinical response. If an opioid analgesic is initiated in a patient already taking a benzodiazepine or other CNS depressant, prescribe a lower initial dose of the opioid analgesic, and titrate based on clinical response. Follow patients closely for signs and symptoms of respiratory depression and sedation.

Advise both patients and caregivers about the risks of respiratory depression and sedation when Arrow-Tramadol is used with benzodiazepines or other CNS depressants (including alcohol and illicit drugs). Advise patients not to drive or operate heavy machinery until the effects of concomitant use of the benzodiazepine or other CNS depressant have been determined. Screen patients for risk of substance use disorders, including opioid abuse and misuse, and warn them of the risk for overdose and death associated with the use of additional CNS depressants including alcohol and illicit drugs (see Section 4.5 Interactions with other medicines and other forms of interaction).

#### **Acute abdominal conditions**

The administration of tramadol may complicate the clinical assessment of patients with acute abdominal conditions.

#### **Respiratory depression**

Arrow-Tramadol should be administered cautiously in patients at risk of respiratory depression.

When large doses of tramadol are administered with anaesthetic medications or alcohol, respiratory depression may result. Cases of intra-operative respiratory depression, usually with large intravenous doses of tramadol and with concurrent administration of respiratory depressants, have been reported.

#### **Increased intracranial pressure or head trauma**

Tramadol should be used with caution in patients with increased intracranial pressure, head injury, shock or a reduced level of consciousness of uncertain origin. Pupillary changes (miosis) from tramadol may obscure the existence, extent, or course of intracranial pathology. Clinicians should also maintain a high index of suspicion for adverse drug reaction when evaluating altered mental status in these patients if they are receiving tramadol.

#### **Serotonin syndrome (serotonin toxicity)**

Tramadol is known to cause Serotonin syndrome when used concomitantly with other medicines that increase serotonin levels. The presence of another drug that increases serotonin by any mechanism should alert the treating physician to the possibility of an interaction. Signs of serotonin syndrome may be, for example, confusion, agitation, fever, sweating, ataxia, hyperreflexia, myoclonus and diarrhoea. Withdrawal of the serotonergic medicines usually brings about a rapid improvement. Drug treatment depends on the nature and severity of the symptoms (see Section 4.5 Interaction with other medicines and other forms of interaction).

#### **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.

#### **Renal and hepatic disease**

With the prolonged half-life in these conditions, achievement of steady state is delayed, so that it may take several days for elevated plasma concentrations to develop.

##### *Renal disease*

In patients with renal insufficiency the elimination of tramadol is delayed. In these patients prolongation of the dosage intervals should be carefully considered according to the patient's requirements. As tramadol is removed very slowly by haemodialysis or haemofiltration, post-dialysis administration to maintain analgesia is not usually necessary.

##### *Hepatic disease*

Metabolism of tramadol and M1 is reduced in patients with advanced cirrhosis of the liver. In cirrhotic patients, dosage reduction is recommended (see Section 4.2 Dose and method of administration).

#### **Patients physically dependent on opioids**

Tramadol is not recommended as a substitute in opioid-dependent patients. Although tramadol is an opiate-agonist, it cannot suppress opioid withdrawal symptoms. Animal experiments have shown that under certain circumstances the administration of tramadol may provoke a withdrawal syndrome in opioid-dependent monkeys. Because of the difficulty in assessing dependence in patients who have previously received substantial amounts of opioid medications, caution should be used in the administration of tramadol to such patients.

In patients with a tendency for drug abuse or dependence, treatment with tramadol should only be carried out for short periods under strict medical supervision.

Cases of dependence and abuse of tramadol have been reported rarely.

### **Seizure risk**

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. In addition, tramadol may increase the seizure risk in patients taking other medication that lowers the seizure threshold (see Section 4.5 Interaction with other medicines and other forms of interaction). Patients with epilepsy or those susceptible to seizures should only be treated with tramadol if there are compelling circumstances.

### **Anaphylactoid reactions**

Serious and rarely fatal anaphylactoid reactions have been reported in patients receiving tramadol. These reactions often occur following the first dose. Other reported reactions include pruritus, hives, bronchospasm and angioedema.

### **Intra-operative use**

In one study using nitrous oxide/tramadol anaesthetic technique (with only intermittent administration of enflurane "as required"), tramadol was reported to enhance intra-operative recall. Hence its use during potentially very light levels of general anaesthesia should be avoided. Two recent studies of tramadol administration during anaesthesia comprising continuous administration of isoflurane did not show clinically significant lightening of anaesthetic depth or intra-operative recall. Therefore, providing the current practice of administering continuous, potent (volatile or intravenous) anaesthetic agent is followed, tramadol may be used intra-operatively in the same way as other analgesic agents are routinely used.

### **Long-term use**

Tramadol has been studied in controlled clinical trials for periods of up to three months. In one small uncontrolled study, patients with cancer pain received a dose of 150 mg tramadol per day for up to six months. Beyond six months no clinical studies investigating the safety and efficacy of tramadol are available.

When tramadol treatment of pain is required long-term, careful and regular monitoring should be carried out to establish whether, and to what extent, ongoing treatment is necessary.

### **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%

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

##### Use with CNS depressants

Tramadol should be used with caution and in reduced dosages when administered to patients receiving CNS depressants (including benzodiazepines and other sedatives/hypnotics, anxiolytics, tranquilizers, muscle relaxants, general anesthetics, drugs with antihistamine-sedating actions such as antipsychotics, other opioids and alcohol).

Due to additive pharmacologic effect, the concomitant use of benzodiazepines or other CNS depressants including alcohol, increases the risk of respiratory depression, profound sedation, coma and death.

Reserve concomitant prescribing of these drugs for use in patients for whom alternative treatment options are inadequate. Limit dosages and durations to the minimum required. Follow patients closely for signs of respiratory depression and sedation (see Section 4.4 Special warnings and precautions for use).

The combination of tramadol with mixed opiate agonists/antagonists (eg. buprenorphine, pentazocine) is not advisable because the analgesic effect of a pure agonist may be theoretically reduced in such circumstances.

##### Use with other serotonergic agents

The presence of another drug that increases serotonin by any mechanism should alert the treating physician to the possibility of an interaction. Concomitant therapeutic use of tramadol and serotonergic medicines such as selective serotonin re-uptake inhibitors (SSRIs), serotonin-norepinephrine reuptake inhibitors (SNRIs), MAO inhibitors (see Section 4.3 Contraindications), tricyclic antidepressants and mirtazapine may cause serotonin toxicity.

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°C and inducible or ocular clonus

Withdrawal of the serotonergic medicines usually brings about a rapid improvement. Drug treatment depends on the nature and severity of the symptoms.

##### Use with coumarin derivatives

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

##### Drugs which reduce the seizure threshold

Tramadol can induce convulsions and increase the potential for selective serotonin re-uptake inhibitors, norepinephrine reuptake inhibitors (SNRIs), tricyclic antidepressants, antipsychotics and

other seizure threshold lowering agents (such as bupropion, mirtazapine, tetrahydrocannabinol) to cause convulsions.

#### Use with MAO inhibitors

Tramadol should not be used in patients who are taking MAO inhibitors or who have taken them within the last fourteen days, as tramadol inhibits the uptake of noradrenaline and serotonin (see Section 4.3 Contraindications).

#### Other interactions

Tramadol does not appear to induce its own metabolism in humans, since observed maximal plasma concentrations after multiple oral doses are higher than expected based on single-dose data. Tramadol is a mild inducer of selected drug metabolism pathways measured in animals.

Concomitant administration of tramadol with carbamazepine causes a significant increase in tramadol metabolism, presumably through metabolic induction by carbamazepine. Patients receiving chronic carbamazepine doses of up to 800 mg daily may require up to twice the recommended dose of tramadol.

Tramadol is metabolised to M1 by the CYP2D6 P450 isoenzyme. Drugs that selectively inhibit that isoenzyme (quinidine, phenothiazines, antipsychotic agents) may cause increased concentrations of tramadol and decreased concentrations of M1. The clinical consequences of these potential effects have not been fully investigated.

Concomitant administration of tramadol with cimetidine does not result in clinically significant changes in tramadol pharmacokinetics. Therefore no alteration of the tramadol dosage regimen is recommended.

Other drugs known to inhibit the CYP3A4 isoenzyme of cytochrome P450, such as ketoconazole and erythromycin, may inhibit the metabolism of tramadol (via N-demethylation) and probably the metabolism of the active O-demethylated metabolite (M1). The clinical importance of such an interaction has not been studied.

In a limited number of studies, the pre- or post-operative 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 – Category C**

There are no adequate and well-controlled studies with tramadol in pregnant women, therefore, tramadol should not be used during pregnancy. Studies in animals using IV or IM routes of administration have not been conducted. Tramadol has been shown to be embryotoxic and foetotoxic in mice, rats and rabbits in maternally toxic doses of 120 mg/kg in mice, or higher in rats and 75 mg/kg in rabbits, but was not teratogenic at these dose levels. No harm to the foetus due to tramadol was seen at doses that were not maternally toxic. No drug-related teratogenic effects were observed in progeny of mice, rats or rabbits treated with tramadol (75 mg/kg for rats or 175 mg/kg for rabbits). Embryo and foetal toxicity consisted primarily of decreased foetal weights, skeletal ossification and increased supernumerary ribs at maternally toxic dose levels. Transient delays in development or behavioural parameters were also seen in pups from rat dams allowed to deliver. Embryo and foetal lethality were reported only in one rabbit study at 300 mg/kg, a dose that would cause extreme maternal toxicity in the rabbit.

In peri- and post-natal studies in rats, progeny of dams receiving oral (gavage) dose levels of 50 mg/kg or greater had decreased weights and pup survival was decreased early in lactation at 80 mg/kg

(6-10 times the maximum human dose). No toxicity was observed for progeny of dams receiving 8, 10, 20, 25 or 40 mg/kg. Maternal toxicity was observed at all dose levels.

### **Labour and Delivery**

Tramadol should not be used in pregnant women prior to or during labour unless the potential benefits outweigh the potential risks, because safe use in pregnancy has not been established. Chronic use during pregnancy may lead to neonatal withdrawal symptoms. If tramadol were to be used during labour, it may cause respiratory depression in the newborn. Tramadol has been shown to cross the placenta. The mean ratio of serum tramadol in the umbilical veins compared to maternal veins was 0.83 for 40 women given tramadol during labour.

The effect of tramadol, if any, on the later growth, development, and functional maturation of the child is unknown.

### **Use in lactation**

Tramadol is not recommended during breast feeding, because its safety in infants and newborns has not been studied. Low levels of tramadol have been detected in breast milk. Following a single intravenous 100 mg dose of tramadol, the cumulative excretion in breast milk within 16 hours post-dose was 100 µg of tramadol (0.1% of the maternal dose) and 27 µg of M1.

### **Carcinogenesis, Mutagenesis and Impairment of Fertility**

Tramadol was not mutagenic in the following assays: Ames Salmonella microsomal activation test, CHO/HPRT mammalian cell assay, mouse lymphoma assay (in the presence of metabolic activation), dominant lethal mutation tests in mice, chromosome aberration test in Chinese hamster cells, and bone marrow micronucleus tests in mice and Chinese hamster cells. Weakly mutagenic results occurred in the presence of metabolic activation in the mouse lymphoma assay and micronucleus tests in rat cells. Overall, the weight of evidence from these tests indicates tramadol does not possess a genotoxic risk to humans.

A slight, but statistically significant increase in two common murine tumours (pulmonary and hepatic) was observed in a mouse carcinogenicity study, particularly in aged mice dosed orally up to 30 mg/kg for approximately two years. Although the study was not conducted using the Maximum Tolerated Dose, or at exposure levels expected in clinical use, this finding is not believed to suggest risk in humans. No such findings occurred in a rat carcinogenicity study.

No effects on fertility were observed for tramadol at oral dose levels up to 50 mg/kg.

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

Due to its sedative effect, patients should be advised to avoid driving or operating machinery whilst taking Arrow-Tramadol.

#### **4.8 Undesirable effects**

Adverse reactions that may occur after administration of tramadol resemble those known to occur with opioids. Adverse reactions were recorded in 13,802 patients from trials with different formulations of tramadol. The nature and incidence of reactions (in CIOMS format where very common  $\geq 1/10$ ; common  $\geq 1/100$  and  $<1/10$ ; uncommon  $\geq 1/1000$  and  $<1/100$ ; rare  $\geq 1/10,000$  and  $<1/1000$ ; and very rare  $\leq 1/10,000$ ) were as follows:

##### **Cardiovascular**

*Uncommon:* tachycardia, flushing

*Rare:* bradycardia

##### **Investigations**

*Rare:* increase in blood pressure

### **Vascular disorders**

*Uncommon:* orthostatic dysregulation (tendency to collapse and cardiovascular collapse)

### **Respiratory, thoracic and mediastinal disorders**

*Rare:* dyspnoea, respiratory depression (when recommended doses are considerably exceeded and other respiratory depressant substances are administered concomitantly)

*Very rare:* worsening of asthma (causality not established)

### **Gastrointestinal**

*Very common:* nausea

*Common:* vomiting, constipation

*Uncommon:* dyspepsia, diarrhoea, abdominal pain, flatulence, urge to vomit

### **Metabolism and nutrition disorders**

*Rare:* changes in appetite

### **Hepatobiliary disorders:**

*Very rare:* elevated liver enzymes

### **Nervous system disorders**

*Very common:* dizziness

*Common:* autonomic nervous effects (mainly dry mouth, perspiration), headache sedation, asthenia

*Uncommon:* trembling

*Rare:* speech disorders, paraesthesia, coordination disturbance, tremor, seizures, involuntary muscle contractions, syncope

### **Psychiatric disorders**

*Rare:* hallucinations, confusional state, sleep disturbance, delirium, anxiety, nightmares, changes in mood (usually euphoric mood, occasionally dysphoria), changes in activity (usually suppression, occasionally increase), changes in cognitive and sensorial capacity (eg. decision behaviour, perception disorders)

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

*Rare:* motor system weakness

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

*Common:* fatigue

### **Endocrine**

*Very rare:* Syndrome of inappropriate antidiuretic hormone secretion characterised by hyponatraemia secondary to decreased free-water excretion

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

*Common:* sweating

*Uncommon:* skin reactions, pruritus, rash

### **Immune system disorders**

*Rare:* shock reactions, anaphylaxis, allergic reactions

### **Renal and urinary disorders**

*Rare:* micturition disorders (difficulty in passing urine and urinary retention), dysuria

### **Eye disorders**

*Rare:* miosis, mydriasis, visual disturbance (blurred vision)



The incidence of "non-specific CNS irritation" (dizziness), "autonomic nervous effects" (perspiration), "orthostatic dysregulation (tendency to collapse and cardiovascular collapse) and tachycardia and "nausea/urge to vomit/vomiting" can be increased with rapid intravenous administration and also tends to be dose dependent. No tests of significance have been performed.

### **Drug withdrawal reactions**

Prolonged administration of tramadol may lead to dependence. In very rare cases (<0.1%) typical opiate withdrawal reactions include symptoms as follows: agitation, anxiety, nervousness, insomnia, hyperkinesia, tremor, pyrexia, myalgia, chills 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 (ie. confusion, delusions, personalization, derealisation, paranoia).

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

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

## **4.9 Overdose**

Few cases of overdose with tramadol have been reported.

### Symptoms

Symptoms of overdosage with tramadol are similar to those of other centrally acting analgesics (opioids) and include miosis, vomiting, cardiovascular collapse, consciousness disorders including coma, convulsions, respiratory depression and respiratory arrest.

### Treatment

Should overdosage occur, general emergency measures should be implemented. Keep the respiratory airways open, and maintain respiration and circulation.

Activated charcoal may reduce absorption of the drug if given within 1 to 2 hours after ingestion. In patients who are not fully conscious or have impaired gag reflex, considerations should be given to administering activated charcoal via a nasogastric tube, once the airway is protected.

Naloxone will reverse respiratory depression, but not all symptoms caused by overdosage with tramadol. Convulsions occurring in mice following the administration of toxic doses of tramadol could be suppressed with barbiturates or benzodiazepines, but were increased with naloxone. If convulsions are observed, diazepam should be given intravenously. Naloxone did not change the lethality of an overdose in mice.

Tramadol is minimally eliminated from the serum by haemodialysis or haemofiltration. Therefore treatment of overdosage with tramadol with haemodialysis or haemofiltration alone is not suitable for detoxification.

For advice on the management of overdose please contact the National Poisons Centre on 0800 POISON (0800 764766).

## **5. PHARMACOLOGICAL PROPERTIES**

### **5.1 Pharmacodynamic properties**

Pharmacotherapeutic group: Analgesics, other opioids, ATC code: N02AX02

Tramadol is a centrally-acting synthetic analgesic of the aminocyclohexanol group with opioid-like effects. It is not derived from natural sources, nor is it chemically related to opiates. Although pre-clinical testing has not completely explained the mode of action, at least two complementary

mechanisms appear applicable: binding to  $\mu$ -opioid receptors and inhibition of re-uptake of noradrenaline and serotonin. The opioid-like activity of tramadol derives from low affinity binding of the parent compound to  $\mu$ -opioid receptors and higher affinity binding of the principal active metabolite, O-desmethyltramadol, denoted M1, to  $\mu$ -opioid receptors. In animal models, M1 is up to 6 times more potent than tramadol in producing analgesia and 200 times more potent in  $\mu$ -opioid binding. The contribution to human analgesia of tramadol relative to M1 is unknown.

Both animal and human studies have shown that antinociception induced by tramadol is only partially antagonised by the opiate antagonist naloxone. In addition, tramadol has been shown to inhibit re-uptake of noradrenaline and serotonin in vitro, as have some other opioid analgesics. These latter mechanisms may contribute independently to the overall analgesic profile of tramadol.

The analgesic effect is dose-dependant, but the relationship between serum concentrations and analgesic effect varies considerably between individuals. In one study, the median serum concentration of tramadol required for effective post-operative analgesia was 300 ng/mL, with individual values ranging from 20 to 990 ng/mL.

Apart from analgesia, tramadol may produce other symptoms similar to that of opioids including: dizziness, somnolence, nausea, constipation, sweating and pruritus. However, tramadol causes significantly less respiratory depression than morphine. In contrast to morphine, tramadol has not been shown to cause histamine release. At therapeutic doses, tramadol has no clinically significant effect on heart rate, left ventricular function or cardiac index. Orthostatic changes in blood pressure have been observed.

## **5.2 Pharmacokinetic properties**

Tramadol is administered as a mixture of two stereoisomers; the following information refers to the combined concentration of both isomers. Tramadol has a linear pharmacokinetic profile within the therapeutic dosage range.

### Absorption

Tramadol is rapidly and almost completely absorbed after oral administration of 50 mg capsules following a mean absorption delay ( $t_0$ ) of approximately thirty minutes. The absorption half-life ( $t_{1/2}$ ) is  $23 \pm 11$  minutes. After oral administration of two 50 mg capsules, the mean absolute bioavailability (f<sub>abs</sub>) is 68-72%, and the peak serum level ( $C_{max}$ ) is reached two hours (range one to three) after administration. The mean peak plasma concentration ( $C_{max}$ ) is approximately 280 ng/mL after oral administration of two capsules. At this time, the mean serum concentration after intravenous injection is 1.46 times higher, amounting to approximately 410 ng/mL.

Oral administration of tramadol with food does not significantly affect its rate or extent of absorption. Therefore tramadol can be administered without regard to food.

After repeated oral administration of 50 mg and 100 mg tramadol capsules at six hourly intervals, steady state is reached 30 to 36 hours after the first administration and the bioavailability is greater than 90%. The plasma concentrations at steady state exceeded by 52% and 36% those extrapolated from the single dose administration studies with 50 mg and 100 mg capsules, respectively. This can be explained by first pass metabolic saturation.

### Distribution

Tramadol is rapidly distributed in the body, with a volume of distribution of 2 - 3 L/kg in young adults. The volume of distribution is reduced by about 25% in those aged over 75 years. Plasma protein binding is about 20% and is independent of concentration up to 10  $\mu$ g/mL. Saturation of plasma protein binding occurs only at concentrations outside the clinically relevant range.

Tramadol crosses the placental and blood-brain barriers. Very small amounts of tramadol and M1 are found in breast milk (0.1% and 0.02% respectively of the administered dose).

### Metabolism

Tramadol is extensively metabolised after oral administration. The major metabolic pathways appear to be N - and O -demethylation and glucuronidation or sulfation in the liver. Only O -desmethyltramadol (M1) is pharmacologically active. Production of M1 is dependent on the CYP2D6 isoenzyme of cytochrome P450. Patients who metabolise drugs poorly via CYP2D6 may obtain reduced benefit from tramadol, due to reduced formation of M1. N-demethylation is catalysed by the CYP3A4 isoenzyme of cytochrome P450. 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.

### Excretion

Tramadol and its metabolites are excreted mainly by the kidneys, with a cumulative renal excretion (tramadol and metabolites) of approximately 95%. In young adults approximately 15 - 19% of an administered dose of tramadol is excreted in the urine as unmetabolised drug. In the elderly, this increases to about 35%. Biliary excretion is of little importance. In young adults, the half-life of tramadol is 5 - 7 h and the half-life of M1 is 6 - 8 h. Total clearance is approximately 430 - 610 mL/min.

### **Pharmacokinetics in patients with hepatic or renal impairment**

Elimination of tramadol and M1 is impaired in patients with hepatic or renal impairment (see Section 4.4 Special warnings and precautions for use). In patients with hepatic impairment, the mean half-life of tramadol was found to be 13 h (range up to 19 h), and the mean half-life of M1 was 19 h (range up to 36 h). In patients with severe renal impairment (creatinine clearance < 5mL/min) the mean half-life of tramadol was 11 h (range up to 20 h), and the mean half life of M1 was 17 h (range up to 43 h).

### **Pharmacokinetics in the elderly**

In the elderly (age over 75 years), the volume of distribution of tramadol is decreased by 25% and clearance is decreased by 40%. As a result, tramadol C<sub>max</sub> and total exposure are increased by 30% and 50%, respectively, but the half-life of tramadol is only slightly prolonged (by 15%).

### **5.3 Preclinical safety data**

None.

## **6. PHARMACEUTICAL PARTICULARS**

### **6.1 List of excipients**

Microcrystalline cellulose, sodium starch glycolate, colloidal anhydrous silica, magnesium stearate and purified water. Excipients in the capsule shell are: Yellow ferric oxide (E172), Indigo carmine (E132), Titanium dioxide (E171), Sodium lauryl sulfate, Methyl parahydroxybenzoate (E218), Propyl parahydroxybenzoate (E216) & Gelatin.

### **6.2 Incompatibilities**

Not applicable.

### **6.3 Shelf life**

36 months

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

Store below 25°C. Store in original package.

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

PVC/PVdC/Aluminium foil blister strips. Pack size of 10, 20, 100, 1000 capsules.

**Not all pack sizes or pack types may be marketed.**

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

No special requirements for disposal.

## **7. MEDICINE SCHEDULE**

Prescription Medicine

## **8. SPONSOR**

Teva Pharma (New Zealand) Limited

PO Box 128 244

Remuera

Auckland 1541

Telephone: 0800 800 097

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

26 November 2009

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

6 April 2020

## **SUMMARY TABLE OF CHANGES**

<b>Section changed</b>	<b>Summary of new information</b>
4.2, 4.3	Revised information for use in paediatric population, specifically children under 12 years and for Special Populations – Renal insufficiency.
4.4	Revised information relating to risk of post-operative use of tramadol in children. Warning regarding CYP2D6 metabolism of tramadol and deficiency of CYP2D6 enzyme.
4.8	Information on drug withdrawal reactions has been clarified.
4.9	Overdosage treatment advice updated to current clinical practice.