

# AUSTRALIAN PRODUCT INFORMATION

## SOMAC<sup>®</sup> (PANTOPRAZOLE SODIUM) Injection

### 1 NAME OF THE MEDICINE

Pantoprazole sodium

### 2 QUALITATIVE AND QUANTITATIVE COMPOSITION

Somac 40 mg injection, each vial contains 42.3 mg pantoprazole sodium equivalent to 40 mg pantoprazole.

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

### 3 PHARMACEUTICAL FORM

Powder for injection.

Pantoprazole sodium is a white to off-white amorphous hygroscopic powder.

### 4 CLINICAL PARTICULARS

#### 4.1 THERAPEUTIC INDICATIONS

Short-term use where oral therapy is not appropriate for:

1. Symptomatic improvement and healing of gastrointestinal diseases which require a reduction in acid secretion:
  - Duodenal ulcer
  - Gastric ulcer
  - Reflux oesophagitis
  - Gastrointestinal lesions refractory to H<sub>2</sub> blockers
  - Zollinger-Ellison Syndrome
2. Maintenance of healed reflux oesophagitis in patients previously treated for moderate to severe reflux oesophagitis.

Note. Patients whose gastric or duodenal ulceration is not associated with ingestion of non-steroidal anti-inflammatory drugs require treatment with anti-microbial agents in addition to anti-secretory drugs, whether on first presentation or recurrence.

#### 4.2 DOSE AND METHOD OF ADMINISTRATION

Duodenal ulcer, gastric ulcer, gastrointestinal lesions refractory to H<sub>2</sub> blockers, Zollinger-Ellison syndrome 40 mg per day

Reflux oesophagitis 20-40 mg per day

Intravenous Somac should be replaced with oral therapy as soon as practicable.

## **Preparation for use**

A ready-to-use solution is prepared by injecting 10 mL Sodium Chloride Intravenous Infusion 0.9% into the vial containing the dry powder. This solution may be administered directly or may be administered after mixing with 100 mL Sodium Chloride Intravenous Infusion 0.9% or 100 mL Glucose Intravenous Infusion 5 or 10%. The resulting solution should be used within 12 hours stored at 2–8°C, and is for SINGLE USE ONLY.

After preparation, the solution should be administered over 2 to 15 minutes.

This product must not be mixed with other medicinal products other than those stated above.

## **Use in children**

There are no data currently available on the use of pantoprazole IV in children.

## **Use in the elderly**

The usual daily dose of 20 mg or 40 mg can be given.

## **Impaired Renal Function**

The usual daily dose of 20 mg or 40 mg can be given.

## **Impaired Hepatic Function**

Pantoprazole is contraindicated in patients with cirrhosis or severe liver disease (see section 4.3 Contraindications). With milder forms of liver disease, the initial dose should be reduced.

## **Instructions for use and handling**

To reduce microbiological hazard, use as soon as practicable after reconstitution/preparation. If storage is necessary, hold at 2°C-8°C for not more than 12 hours.

This product contains no antimicrobial agent. Somac injection is for single use in one patient only. Any unused product remaining or the visual appearance of which has changed (e.g. if cloudiness or precipitation is observed), should be discarded.

## **4.3 CONTRAINDICATIONS**

Known hypersensitivity to pantoprazole, substituted benzimidazoles or any other components of the formulation or in cases of cirrhosis or severe liver disease.

Pantoprazole, like other proton pump inhibitors, should not be co-administered with HIV protease inhibitors, such as atazanavir or nelfinavir (see section 4.5 Interactions with other medicines and other forms of interactions).

## **4.4 SPECIAL WARNINGS AND PRECAUTIONS FOR USE**

### **Check the following before use**

The intravenous administration of Somac injection is recommended only if oral application is not appropriate.

In the presence of any alarm symptoms (e.g. significant unintentional weight loss, recurrent vomiting, dysphagia, haematemesis, anaemia or melaena) and when gastric ulcer is suspected or present, malignancy should be excluded, as treatment with pantoprazole may alleviate symptoms and delay diagnosis. Further investigation is to be considered if symptoms persist despite adequate treatment.

## **Clostridium difficile**

PPI therapy may be associated with an increased risk of *Clostridium difficile* infection.

Pantoprazole, like all proton pump inhibitors, might be expected to increase the counts of bacteria normally present in the upper gastrointestinal tract. Treatment with pantoprazole may lead to a slightly increased risk of gastrointestinal infections caused by bacteria such as *Salmonella*, *Campylobacter* and *Clostridium difficile*.

## **Severe Cutaneous Adverse Reactions**

Severe cutaneous adverse reactions, including erythema multiforme, Stevens-Johnson syndrome (SJS), toxic epidermal necrolysis (TEN), drug reaction with eosinophilia and systemic symptoms (DRESS), and acute generalized exanthematous pustulosis (AGEP) have been reported in association with the use of PPIs (see section 4.8 Adverse Effects (Undesirable Effects)). Discontinue pantoprazole at the first signs or symptoms of severe cutaneous adverse reactions or other signs of hypersensitivity and consider further evaluation.

## **Subacute Cutaneous Lupus Erythematosus (SCLE)**

Proton pump inhibitors are associated in rare cases with the occurrence of subacute cutaneous lupus erythematosus (SCLE). If lesions occur, especially in sun exposed areas of the skin, and if accompanied by arthralgia, the patient should seek medical help promptly and the healthcare professional should consider stopping the product.

## **Bone fracture**

PPI therapy may be associated with an increased risk for osteoporosis-related fractures of the hip, wrist, or spine. The risk of fracture was increased in patients who received high-doses; defined as multiple daily doses, and long-term PPI therapy (a year or longer).

## **Acute Interstitial Nephritis**

Acute interstitial nephritis has been observed in patients taking PPIs including pantoprazole. Acute interstitial nephritis may occur at any point during PPI therapy and is generally associated to an idiopathic hypersensitivity reaction. Discontinue pantoprazole if acute interstitial nephritis develops.

## **Hypomagnesaemia**

Hypomagnesaemia has been rarely reported in patients treated with PPIs for at least three months (in most cases after a year of therapy). Serious consequences of hypomagnesaemia include tetany, arrhythmia, and seizure. Hypomagnesaemia may lead to hypocalcaemia and/or hypokalaemia (see section 4.8 Adverse Effects (Undesirable Effects)).

## **Influence on vitamin B12 absorption**

In patients with Zollinger-Ellison syndrome and other pathological hypersecretory conditions requiring long-term treatment, pantoprazole, as all acid-blocking medicines, may reduce the absorption of vitamin B12 (cyanocobalamin) due to hypo- or achlorhydria. This should be considered in patients with reduced body stores or risk factors for reduced vitamin B12 absorption (such as the elderly) on long-term therapy or if respective clinical symptoms are observed.

## **Pemetrexed**

Concomitant administration of proton pump inhibitors (PPIs) with pemetrexed may increase pemetrexed-related toxicity. Caution should be taken when these medicinal products are co-administered.

## General Toxicity

### Gastrointestinal system

Treatment with pantoprazole causes dose-dependent hypergastrinaemia as a result of inhibition of gastric acid secretion. Gastrin has a trophic effect on the gastric mucosa, and increases in gastric weight have been observed in rats and dogs to be dependent upon both dose and duration of treatment. Accompanying histopathological changes in the gastric mucosa were increased height, dilatation of fundic glands, chief cell hyperplasia and/or atrophy and parietal cell hyperplasia or vacuolation/degeneration. Increased density of enterochromaffin-like (ECL) cells was observed after 12 months treatment at dose levels from 5 mg/kg/day in rats and 2.5 mg/kg/day in dogs; all changes were reversible after various recovery periods. Since these gastric effects are a consequence of the pharmacological effect of acid secretion inhibition, no-effect doses were not established in all instances.

Although rats might be more susceptible to this effect than other species because of their high ECL cell density and sensitivity to gastrin, ECL cell hyperplasia occurs in other species, including mice and dogs, and has been observed in one of two clinical trials in which ECL cell density was measured (a 2-fold increase was observed in study RR126/97 after up to 5 years of treatment with regular and high doses, but no increase was observed in study RR125/97). No dysplastic or neoplastic changes were observed in gastric endocrine cells in either study.

### Ocular toxicity and dermal phototoxicity/sensitivity

Studies have shown that pantoprazole is retained in low levels in the eyes and skin of pigmented rats. It is likely that the retention reflects a reversible association with melanin. Animal studies investigating the potential for phototoxicity/photosensitivity have not been conducted. A 2-week dog study, conducted specifically to investigate the effects on the eye and ear, did not reveal any changes relating to pantoprazole treatment, but the doses chosen were relatively low (40 and 160 mg (about 4 and 15 mg/kg) orally and 60 mg (about 6 mg/kg) IV). No ophthalmological changes or changes in electroretinographs were observed in cynomolgus monkeys at IV doses of up to 15 mg/kg/day for 4 weeks.

### **Use in the elderly**

No dose adjustment is necessary in elderly patients (See Sections 4.2 Dose and Method of Administration; use in the elderly, 4.4. Special Warnings and Precautions for use; Influence on vitamin B12 absorption and 5.2 Pharmacokinetic Properties; excretion).

### **Paediatric use**

To date there has been no experience with pantoprazole IV treatment in children.

### **Effects on Laboratory Tests**

Increased Chromogranin A (CgA) level may interfere with investigations for neuroendocrine tumours. To avoid this interference, proton pump inhibitor treatment should be stopped 14 days before CgA measurements.

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

Pantoprazole is metabolised in the liver via the cytochrome P450 enzyme system. A study using human liver microsomes suggested that the P450 enzymes CYP2C19 and CYP3A4 are involved in its metabolism. In addition, CYP2D6 and CYP2C9-10 were implicated in another study. An interaction of pantoprazole with other drugs or compounds which are metabolised using the same enzyme system cannot be excluded. However, no clinically significant interactions were observed in specific tests with a number of such drugs or compounds, namely carbamazepine, caffeine, diazepam, diclofenac, digoxin, ethanol, glibenclamide, metoprolol, naproxen, nifedipine, phenytoin,

piroxicam, theophylline, and the low dose oral contraceptive Triphasil® (levonorgestrel and ethinyl oestradiol). There was also no interaction with a concomitantly administered antacid (aluminium hydroxide and magnesium hydroxide).

Treatment of dogs with IV famotidine shortened the duration of the pH elevation effect of pantoprazole.

Four cross-over pharmacokinetic studies designed to examine any interactions between pantoprazole and the drugs clarithromycin, amoxicillin and metronidazole, conducted in 66 healthy volunteers, showed no interactions.

### **Drugs with pH-Dependent Absorption Pharmacokinetics**

As with all acid suppressant medications, the absorption of drugs whose bioavailability is pH dependent (e.g. ketoconazole, itraconazole, posaconazole, erlotinib), might be altered due to the decrease in gastric acidity.

### **HIV Protease Inhibitors**

It has been shown that co-administration of atazanavir 300 mg/ritonavir 100 mg with omeprazole (40 mg once daily) or atazanavir 400 mg with lansoprazole (60 mg single dose) to healthy volunteers resulted in a substantial reduction in the bioavailability of atazanavir. The absorption of atazanavir is pH dependent. Therefore proton pump inhibitors, including pantoprazole, should not be co-administered with HIV protease inhibitors for which absorption is dependent on acidic intragastric pH, such as atazanavir or nelfinavir (see section 4.3 Contraindications).

### **Mycophenolate mofetil**

Co-administration of PPIs in healthy subjects and in transplant patients receiving mycophenolate mofetil has been reported to reduce the exposure to the active metabolite, mycophenolic acid. This is possibly due to a decrease in mycophenolate mofetil solubility at an increased gastric pH. The clinical relevance of reduced mycophenolic acid exposure on organ rejection has not been established in transplant patients receiving PPIs and mycophenolate mofetil. Use pantoprazole with caution in transplant patients receiving mycophenolate mofetil.

### **Methotrexate**

Concomitant use with methotrexate (primarily at high dose), may elevate and prolong serum levels of methotrexate and/or its metabolite, possibly leading to methotrexate toxicities.

### **Drugs that Inhibit or Induce CYP2C19 (tacrolimus, fluvoxamine)**

Concomitant administration of pantoprazole and tacrolimus may increase whole blood levels of tacrolimus, especially in transplant patients who are intermediate or poor metabolisers of CYP2C19. Inhibitors of CYP2C19, such as fluvoxamine, would likely increase the systemic exposure of pantoprazole.

### **Coumarin anticoagulants (phenprocoumon or warfarin)**

Co-administration of pantoprazole with warfarin or phenprocoumon did not affect the pharmacokinetics of warfarin, phenprocoumon or international normalised ratio (INR). However, there have been reports of increased INR and prothrombin time in patients receiving PPIs and warfarin or phenprocoumon concomitantly. Increases in INR and prothrombin time may lead to abnormal bleeding, and even death. Therefore, in patients being treated with coumarin anticoagulants (e.g. warfarin or phenprocoumon), monitoring of prothrombin time / INR is recommended after initiation, termination or during irregular use of pantoprazole.

## 4.6 FERTILITY, PREGNANCY AND LACTATION

### Effects on fertility

No data available (see Section 5.3 Preclinical Safety Data)

### Use in pregnancy (Category B3)

Teratological studies in rats and rabbits gave no evidence of a teratogenic potential for pantoprazole. In oral rat studies, dose-dependent toxic effects were observed on foetuses and pups: increased pre- and postnatal deaths at 450 mg/kg/day, reduced foetal weight at  $\geq 150$  mg/kg/day and delayed skeletal ossification and reduced pup growth at  $\geq 15$  mg/kg/day. For the latter a no-effect dose was not established. Doses of 450 mg/kg/day were maternotoxic and may have been associated with dystocia and incomplete parturition. Penetration of the placenta was investigated in the rat and was found to increase with advanced gestation. As a result, concentrations of pantoprazole in the foetus are increased shortly before birth regardless of the route of administration.

The significance of these findings in humans is unknown. As there is no information on the safety of the drug during pregnancy in women, pantoprazole should not be used during pregnancy, unless the benefit clearly outweighs the potential risk to the foetus.

### Use in lactation

A peri/post-natal study in rats found that treatment with pantoprazole at doses of 10 mg/kg/day or greater decreased pup growth. A transient effect on one of a series of development tests (startle response) was only evident in the 30 mg/kg/day group at an age when male and female offspring showed lower body weights, paralleled with lower brain weight, than the controls. The significance of these findings for humans is unknown, and there is currently no information on the safety of pantoprazole during breast feeding in humans. Excretion into human milk has been reported. Therefore, pantoprazole should only be used during lactation if the benefits clearly outweigh the risks.

## 4.7 EFFECTS ON ABILITY TO DRIVE AND USE MACHINES

Pantoprazole is not expected to adversely affect the ability to drive or use machines. However, adverse drug reactions such as dizziness and visual disturbances may occur (see Section 4.8 Adverse Effects (Undesirable Effects)). If affected, patients should not drive or operate machines.

## 4.8 ADVERSE EFFECTS (UNDESIRABLE EFFECTS)

Somac injection is well tolerated. Most of the adverse reactions seen with treatment were of mild or moderate intensity. The following adverse reactions have been reported in patients receiving pantoprazole alone or in combination with antibiotics for *H. pylori* eradication in clinical trials and post-marketing surveillance.

Adverse reactions within each body system are listed in descending order of frequency (Very common:  $\geq 10\%$ ; common:  $\geq 1\%$  and  $< 10\%$ ; uncommon:  $\geq 0.1\%$  and  $< 1\%$ ; rare  $\geq 0.01\%$  and  $< 0.1\%$ ; very rare:  $< 0.01\%$ ; not known: cannot be estimated from the available data). These include the following:

### General disorders and administration site conditions

Common: Injection site thrombophlebitis

Uncommon: Fatigue and malaise, asthenia and increased sweating

Rare: fever, peripheral oedema

Very rare: substernal chest pain and hot flushes

Not known: drug fever

### **Cardiovascular disorders general**

Rare: hypertension

Very rare: circulatory collapse

### **Nervous system disorders**

Uncommon: headache, dizziness

Rare: taste disorders, metallic taste

Very rare: reduced movement and speech disorder, changes to the senses of smell and taste

### **Gastrointestinal system disorders**

Uncommon: diarrhoea, nausea/vomiting, abdominal distension and bloating, constipation, dry mouth, abdominal pain and discomfort

Rare: rectal disorder and colonic polyp

Very rare: faecal discoloration and increased saliva

Not known: severe eructation, withdrawal of long-term PPI therapy can lead to aggravation of acid-related symptoms and may result in rebound acid hypersecretion

### **Hearing and vestibular disorders**

Very rare: tinnitus

### **Immune system disorders**

Rare: hypersensitivity (including anaphylactic reactions and anaphylactic shock)

### **Hepatobiliary disorders**

Uncommon: liver enzymes increased

Rare: bilirubin increased

Very rare: hepatocellular failure, cholestatic hepatitis and jaundice

Not known: hepatocellular injury

The occurrence of severe hepatocellular damage leading to jaundice or hepatic failure having a temporal relationship to the oral administration of pantoprazole has been reported with a frequency of approximately one in a million patients.

### **Metabolism and nutrition disorders**

Rare: hyperlipidaemias and lipid increases (triglycerides, cholesterol), weight changes

Not known: hyponatraemia, hypomagnesaemia, hypocalcaemia, hypokalaemia (hypocalcaemia and/or hypokalaemia may be related to the occurrence of hypomagnesaemia (see Section 4.4 Special Warnings Precautions for Use).

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

Rare: myalgia and arthralgia

Very rare: pain including skeletal pain

Not known: fracture of wrist, hip and spine

### **Renal and urinary disorders**

Very rare: tubulointerstitial nephritis (TIN) (with possible progression to renal failure)

### **Platelet, bleeding, clotting disorders**

Very rare: increased coagulation time

### **Psychiatric disorders**

Uncommon: sleep disorders

Rare: depression, hallucination, disorientation and confusion, especially in pre-disposed patients, as well as the aggravation of these symptoms in case of pre-existence.

Very rare: anxiety

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

Rare: anaemia, agranulocytosis

Very rare: leukopaenia, thrombocytopaenia, pancytopaenia

### **Resistance mechanism disorders**

Rare: sepsis

### **Respiratory system disorders**

Very rare: dyspnoea

### **Reproductive system and breast disorders**

Rare: gynaecomastia

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

Uncommon: pruritus, rash/ exanthema/ eruption

Rare: angioedema and urticaria

Very rare: flushing, severe skin reactions such as Stevens Johnson Syndrome, toxic epidermal necrolysis, erythema multiforme, Lyell Syndrome; and photosensitivity

Not known: subacute cutaneous lupus erythematosus, drug reaction with eosinophilia and systemic symptoms (DRESS), acute generalised exanthematous pustulosis

### **Eye disorders**

Uncommon: disturbances in vision (blurred vision)

Very rare: conjunctivitis

### **Reporting suspected adverse effects**

Reporting suspected adverse reactions after registration of the medicinal product is important. It allows continued monitoring of the benefit-risk balance of the medicinal product. Healthcare professionals are asked to report any suspected adverse reactions at <http://www.tga.gov.au/reporting-problems>.

## **4.9 OVERDOSE**

There are no known symptoms of overdosage in humans. In individual cases, 240 mg was administered i.v or p.o. and was well tolerated. Standard detoxification procedures apply.

For information on the management of overdose, contact the Poison Information Centre on 131126 (Australia).

## 5 PHARMACOLOGICAL PROPERTIES

### 5.1 PHARMACODYNAMIC PROPERTIES

#### Mechanism of action

Pantoprazole is a proton pump inhibitor (PPI). It inhibits specifically and dose-proportionately H<sup>+</sup>/K<sup>+</sup>-ATPase, the enzyme which is responsible for gastric acid secretion in the parietal cells of the stomach.

The substance is a substituted benzimidazole which accumulates in the acidic environment of the parietal cells after absorption. There, it is converted into the active form, a cyclic sulphenamide which binds to the H<sup>+</sup>/K<sup>+</sup>-ATPase, thus inhibiting the proton pump and causing potent and long-lasting suppression of basal and stimulated gastric acid secretion. As pantoprazole acts distal to the receptor level, it can influence gastric acid secretion irrespective of the nature of the stimulus (acetylcholine, histamine, gastrin). Oral and intravenous pantoprazole 40 mg/day for 5 days had equivalent effect on intra-gastric pH in 20 healthy adult male volunteers in a randomised, open, 2-period crossover trial with 14-day wash-out. The pre-defined equivalence range was  $\pm 20\%$  for % time with pH < 3 and 4 and  $\pm 1$  pH unit for 24 h median pH. The 24 h median pH on day 5 was 2.7 on oral treatment and 3.2 on intravenous treatment.

Pantoprazole's selectivity is due to the fact that it only exerts its full effect in a strongly acidic environment (pH < 3), remaining mostly inactive at higher pH values. As a result, its complete pharmacological, and thus therapeutic effect, can only be achieved in the acid-secreting parietal cells. By means of a feedback mechanism this effect is diminished at the same rate as acid secretion is inhibited.

As with other proton pump inhibitors and H<sub>2</sub> receptor inhibitors, treatment with pantoprazole causes a reduced acidity in the stomach and thereby an increase in gastrin in proportion to the reduction in acidity. The increase in gastrin is reversible.

#### Clinical trials

Two uncontrolled trials in adults assessed the efficacy of pantoprazole 40 mg/day, administered intravenously for 5-7 days then orally for 3-7 weeks, in the endoscopic healing of Savary-Miller stage 2-3 reflux oesophagitis (Table 1). Using historical data, it was concluded that the IV plus oral regimen was at least equivalent to an exclusively oral regimen. The criterion for at least equivalence was: lower limit of 90% confidence interval of the difference, (IV + oral) - oral, > -15%.

**Table 1 PANTOPRAZOLE 40 mg/day (IV plus oral) IN ENDOSCOPIC HEALING OF STAGE 2-3 OESOPHAGITIS (Intention to treat<sup>1</sup>)**

| Trial                          | N   | % Patients Healed |         |
|--------------------------------|-----|-------------------|---------|
|                                |     | 4 weeks           | 8 weeks |
| FK3050                         | 176 | 65                | 75      |
| BAT010                         | 110 | 77                | 85      |
| Historical (oral) <sup>2</sup> | 357 | 64                | 77      |

<sup>1</sup> Protocol violators counted as non-responders

<sup>2</sup> Trials FK3005, FK3009

## 5.2 PHARMACOKINETIC PROPERTIES

### Absorption

A considerably higher  $C_{max}$  occurs after intravenous administration compared with oral administration. In a study in healthy volunteers given 40 mg/day for 5 days, the steady state  $C_{max}$  was 5.9 mg/L after intravenous administration and 1.7 mg/L after oral administration. Terminal half-life is approximately 1 h. Pharmacokinetics do not vary after single or repeated administration. The plasma kinetics of pantoprazole are linear (in the dose range of 10 to 80 mg) after both oral and intravenous administration.

### Distribution

The serum protein binding of pantoprazole is approximately 98%. Volume of distribution is approximately 0.15 L/kg and clearance is approximately 0.1 L/h/kg.

### Metabolism

Pantoprazole is metabolised in the liver via the cytochrome P450 enzyme system.

### Excretion

Pantoprazole is rapidly eliminated from serum and is almost exclusively metabolised in the liver. Renal elimination represents the most important route of excretion (approximately 80%) for the metabolites of pantoprazole, the rest are excreted with the faeces. The main metabolite in both the serum and urine is desmethyl-pantoprazole which is conjugated with the sulphate. The half-life of the main metabolites (approximately 1.5 h) is not much longer than that of pantoprazole.

In studies in healthy volunteers, 2% of subjects showed a slower elimination of pantoprazole from serum/plasma, with an increase in terminal elimination half-life of up to 10 h. Patients with a half-life of greater than 3.5 h and with an apparent clearance of less than 2 L/h/kg are considered to be slow metabolisers of pantoprazole.

In patients with liver impairment, pantoprazole elimination is significantly delayed. After a 40 mg tablet, AUC increased by a factor of 6-8 and terminal half-life increased from 1 h to 7-9 h in patients with liver cirrhosis compared with healthy subjects.

In patients with renal impairment (including those undergoing dialysis) no dose reduction is required. Although the main metabolite is moderately increased, there is no accumulation. The half-life of pantoprazole is as short as in healthy subjects. Pantoprazole is poorly dialyzable.

The slight increase in AUC and  $C_{max}$  in elderly volunteers compared with their younger counterparts is also not clinically relevant.

## 5.3 PRECLINICAL SAFETY DATA

### Genotoxicity

A number of *in vitro* and *in vivo* genotoxicity assays covering mutagenicity, clastogenicity and DNA damage end points were conducted on pantoprazole and the results were generally negative. Exposures achieved in the *in vivo* tests in mice and rats were well in excess of exposures expected clinically. However, pantoprazole was clearly positive in carefully conducted cytogenetic assays in human lymphocytes *in vitro*, both in the presence and absence of metabolic activation. Omeprazole was also positive in a comparable test conducted in the same laboratory, suggesting a possible class effect. A minute amount of radioactivity was bound to rat hepatic DNA after treatment with 200 mg/kg/day pantoprazole for 14 days. However, no distinct DNA-adduct has been detected.

Pantoprazole was found to be negative in the following studies: *in vivo* chromosome aberration assay in rat and bone marrow (126E/95), mouse lymphoma test (222E/95) and a gene mutation test in

Chinese hamster ovary cells (*in vitro*) (188E/95). In addition, toxicokinetic studies were conducted in rats at the doses used in the bone marrow assay (50 to 1200 mg/kg) (56E/96) and in mice at the high dose from the earlier micronucleus test (710 mg/kg) (89E/96). In both species, pantoprazole exposure was high with the AUCs being 26 to 30 times higher in the rat or mouse respectively, than humans using the 20 mg tablet.

## **Carcinogenicity**

A two year oral carcinogenicity study in Sprague Dawley rats at doses up to 200 mg/kg/day showed gastric carcinoids after pantoprazole treatment at doses greater than 0.5 mg/kg/day in females and greater than 5 mg/kg/day in males, with none observed in controls. The development of gastric tumours is attributed to chronic elevation of serum gastrin levels with associated histopathological changes in the gastrointestinal system.

In both male and female rats, the development of hepatocellular adenomas was increased at doses greater than 5 mg/kg/day and the development of hepatocellular carcinomas was increased at doses greater than 50 mg/kg/day. Hepatocellular tumours, which were also observed in female mice at oral doses greater than 25 mg/kg/day, may be associated with pantoprazole-induced increases in hepatic enzyme activity.

Treatment with pantoprazole at doses greater than 50 mg/kg/day also increased the development of thyroid follicular cell adenomas in male and female rats. Several studies in rats were conducted to investigate the effect of pantoprazole on the thyroid, the results of which suggested that the effect may be secondary to the induction of enzymes in the liver.

In a more recent carcinogenicity study, Fischer rats were studied using lower doses (5, 15 and 50 mg/kg). Gastric carcinoids were detected at all doses in females and at the 15 and 50 mg/kg doses in males and none were detected in controls. No metastases of these carcinoids were detected. There was no increase in incidence of liver tumours. The dose of 15 mg/kg is seen to be the no-effect level for liver tumours in rodents.

Consideration of the possible mechanisms involved in the development of the above drug-related tumour types suggests that it is unlikely that there is any carcinogenic risk in humans at therapeutic dose levels of pantoprazole for short term treatment.

## **6 PHARMACEUTICAL PARTICULARS**

### **6.1 LIST OF EXCIPIENTS**

The 40 mg Injection also contains 1 mg disodium edetate and 0.24 mg sodium hydroxide.

### **6.2 INCOMPATIBILITIES**

This product must not be mixed with other medicinal products other than those stated in section 4.2 Dose and Method of Administration. Please also refer to Section 4.5-Interactions with other medicines and other forms of interactions

### **6.3 SHELF LIFE**

In Australia, information on the shelf life can be found on the public summary of the Australian Register of Therapeutic Goods (ARTG). The expiry date can be found on the packaging.

### **6.4 SPECIAL PRECAUTIONS FOR STORAGE**

Store below 25°C. Keep vial in outer carton to protect from light.

Use as soon as practicable after reconstitution/preparation. If storage is necessary, hold at 2°C-8°C for not more than 12 hours.

## 6.5 NATURE AND CONTENTS OF CONTAINER

The 40 mg injection is supplied in a single clear glass vial with a grey-butyl rubber stopper and an aluminium cap.

## 6.6 SPECIAL PRECAUTIONS FOR DISPOSAL

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

## 6.7 PHYSICOCHEMICAL PROPERTIES

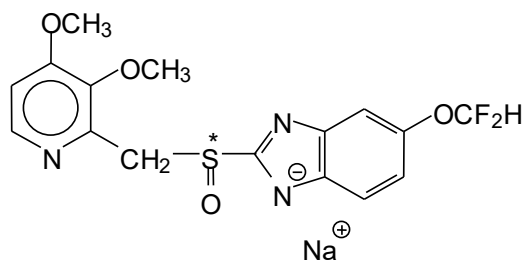
Pantoprazole sodium solubility is low at neutral pH and increases with increasing pH

### Chemical structure

Chemical Name (CAS): Sodium-[5-(difluoromethoxy)-2-[[3,4-dimethoxy-2-pyridinyl)-methyl]-sulfinyl]-1H-benzimidazole.

Molecular formula:  $C_{16}H_{14}F_2N_3NaO_4S$

Molecular weight: 405.5



### CAS number

138786-67-1 (pantoprazole sodium)

## 7 MEDICINE SCHEDULE (POISONS STANDARD)

S4 – Prescription Only Medicine

## 8 SPONSOR

Takeda Pharmaceuticals Australia Pty Ltd  
Level 39  
225 George Street  
Sydney NSW 2000  
Australia  
Telephone: 1800 012 612  
[www.takeda.com/en-au](http://www.takeda.com/en-au)

## 9 DATE OF FIRST APPROVAL

22 December 2006

## 10 DATE OF REVISION

07 July 2026

### Summary table of changes

| <b>Section changed</b> | <b>Summary of new information</b>              |
|------------------------|--|
| 4.8                    | Addition of adverse drug reaction 'Drug fever' |

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