

# AUSTRALIAN PRODUCT INFORMATION – TEVARIPRAZOLE® (ARIPIPRAZOLE) TABLETS

## 1 NAME OF THE MEDICINE

Aripiprazole

## 2 QUALITATIVE AND QUANTITATIVE COMPOSITION

This product contains lactose (as Lactose Monohydrate).

Tevariprazole tablets contain 5, 10, 15, 20 or 30 mg of Aripiprazole.

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

## 3 PHARMACEUTICAL FORM

Tevariprazole 5 mg uncoated tablet: Light yellow coloured round flat faced bevelled edge tablet with debossed '5' on one side and plain on the other side.

Tevariprazole 10 mg uncoated tablet: Pink to light pink coloured, oblong tablet with debossed '10' on one side and breakline on the other side.

Tevariprazole 15 mg uncoated tablet: Light yellow coloured, round flat faced bevelled edge tablet with debossed '15' on one side and breakline on the other side.

Tevariprazole 20 mg uncoated tablet: White to off white or pale cream coloured, capsule shaped biconvex tablet with debossed '20' on one side and breakline on the other side.

Tevariprazole 30 mg uncoated tablet: Pink to light pink coloured, round biconvex tablet with debossed '30' on one side and breakline on the other side.

## 4 CLINICAL PARTICULARS

### 4.1 THERAPEUTIC INDICATIONS

Tevariprazole is indicated for the treatment of schizophrenia including maintenance of clinical improvement during continuation therapy.

### 4.2 DOSE AND METHOD OF ADMINISTRATION

Tevariprazole is available as 5 mg, 10 mg, 15 mg, 20 mg and 30 mg tablets for oral administration.

## **Recommended Dosage**

### **Schizophrenia**

#### *Adults*

The recommended starting dose for aripiprazole tablets is 10 or 15 mg/day administered on a once-a-day schedule without regard to meals. Doses in the range of 10 to 30 mg/day have been effective in clinical trials. Daily dosage may be adjusted on the basis of individual clinical status within the range of 10-30 mg daily. Dosage increases should not be made before 2 weeks, the time needed to achieve steady state. There is no evidence that doses higher than 15 mg/day are more effective than the recommended starting dose of 10-15 mg.

The maintenance dose for aripiprazole tablets is 15 mg/day.

### **Renal impairment**

No dosage adjustment is required in adult patients with renal impairment.

### **Hepatic impairment**

No dosage adjustment is required for adult patients with hepatic impairment (Child-Pugh Class A, B or C).

### **Elderly**

No dosage adjustment is required for patients  $\geq 65$  years of age.

### **Gender**

No dosage adjustment is required for female adult patients relative to male adult patients.

### **Concomitant Medications**

*Dosage adjustment for patients taking aripiprazole concomitantly with potential CYP3A4 inhibitors:* When concomitant administration of a potent CYP3A4 inhibitor such as ketoconazole, itraconazole, clarithromycin and HIV protease inhibitors with aripiprazole occurs, the aripiprazole dose should be decreased. When the CYP3A4 inhibitor is withdrawn from the combination therapy, the aripiprazole dose should then be increased.

*Dosage adjustment for patients taking aripiprazole concomitantly with potential CYP2D6 inhibitors:* When concomitant administration of potential CYP2D6 inhibitors such as quinidine, fluoxetine, or paroxetine with aripiprazole occurs, the aripiprazole dose should be halved. When the CYP2D6 inhibitor is withdrawn from the combination therapy, the aripiprazole dose should then be increased.

*Dosage adjustment for patients taking aripiprazole concomitantly with multiple medications that inhibit CYP3A4 and CYP2D6:* Although no clinical studies have been conducted in which aripiprazole was taken together with multiple drugs that inhibit CYP3A4 and CYP2D6, consideration should be given to reducing the daily dose of aripiprazole in individual circumstances.

*Dosage adjustment for patients taking aripiprazole concomitantly with potential CYP3A4 inducers:* When a potent CYP3A4 inducer such as carbamazepine is added to aripiprazole therapy, the aripiprazole dose

should be increased. Additional dose increases should be based on clinical evaluation. When the CYP3A4 inducer is withdrawn from the combination therapy, the aripiprazole dose should then be reduced.

### **Smoking Status**

No dosage adjustment is required for smoking patients relative to non-smoking patients.

### **Switching from Other Antipsychotics**

Data was prospectively and systematically collected to address the safety of switching from other antipsychotics to aripiprazole (30 mg/day). These data indicate that any of the following methods can be used safely for switching patients to aripiprazole from another antipsychotic monotherapy:

- immediate discontinuation of the patient's current antipsychotic regimen and immediate initiation of aripiprazole;
- immediate initiation of aripiprazole while tapering off the current antipsychotic regimen over a 2-week period;
- upward titration of aripiprazole over a 2-week period and simultaneous tapering off of the patient's current antipsychotic regimen over the same 2-week period.

## **4.3 CONTRAINDICATIONS**

Tevaripiprazole is contraindicated in patients who are hypersensitive to aripiprazole or any of the excipients (see **Section 6.1, List of Excipients**).

For specific information about the contraindications of mood stabilisers refer to **Section 4.3, CONTRAINDICATIONS** when combination with lithium or valproate is indicated.

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

### **Increased Mortality in Elderly Patients with Dementia-Related Psychosis**

Elderly patients with dementia-related psychosis treated with atypical antipsychotic drugs are at an increased risk of death compared to placebo. Analyses of seventeen placebo-controlled trials (modal duration of 10 weeks) in these patients revealed a risk of death in the drug-treated patients of between 1.6 to 1.7 times that seen in placebo-treated patients. Over the course of a typical 10-week controlled trial, the rate of death in drug-treated patients was about 4.5%, compared to a rate of about 2.6% in the placebo group. Although the causes of death varied, most of the deaths appeared to be either cardiovascular (e.g., heart failure, sudden death) or infectious (e.g., pneumonia) in nature.

In three placebo-controlled trials of aripiprazole in elderly patients with psychosis associated with Alzheimer's disease, cerebrovascular adverse events (e.g. stroke, transient ischaemic attack), including fatalities, occurred in 1.3% (8/595) of aripiprazole-treated patients compared with 0.6% (2/343) of placebo-treated patients during the 10-week double-blind period or within 30 days of the last dose for those who discontinued the study during the double-blind phase. The all-cause mortality rate in the same trials over the same period was 3.5% (21/595) in aripiprazole-treated patients and 1.7% (6/343) in the placebo group.

Aripiprazole is not approved for the treatment of patients with dementia-related psychosis.

### **Falls**

Aripiprazole may cause somnolence, postural hypotension, motor and sensory instability, which may lead to falls. Caution should be taken when treating patients at higher risk, and a lower starting dose should be considered (e.g. elderly or debilitated patients) (see **Section 4.2, Dose and Method of Administration**).

### **General**

During antipsychotic treatment, improvement in the patient's clinical condition may take several days to some weeks. Patients should be closely monitored during this period.

### **Suicide**

The possibility of a suicide attempt is inherent in psychotic illnesses and close supervision of high-risk patients should accompany drug therapy. Prescriptions for aripiprazole should be written for the smallest quantity consistent with good patient management, in order to reduce the risk of overdose.

### **Tardive Dyskinesia**

The risk of tardive dyskinesia increases with long-term exposure to antipsychotic treatment. If signs and symptoms of tardive dyskinesia appear in a patient on aripiprazole, a dose reduction or drug discontinuation should be considered. These symptoms can temporally deteriorate or even arise after discontinuation of treatment.

### **Neuroleptic Malignant Syndrome**

A potentially fatal symptom complex sometimes referred to as Neuroleptic Malignant Syndrome (NMS) has been reported in association with administration of antipsychotic drugs including aripiprazole. Rare cases of NMS occurred during aripiprazole treatment in the worldwide clinical database. Clinical manifestations of NMS are hyperpyrexia, muscle rigidity, altered mental status, and evidence of autonomic instability (irregular pulse or blood pressure, tachycardia, diaphoresis, and cardiac dysrhythmia). Additional signs may include elevated creatine kinase, myoglobinuria (rhabdomyolysis), and acute renal failure. If a patient develops signs and symptoms indicative of NMS, or presents with unexplained high fever without additional clinical manifestations of NMS, all antipsychotic drugs, including aripiprazole must be discontinued.

### **Seizure**

In short-term, placebo controlled trials, seizures occurred in 0.1% (3/2467) of adult patients treated with aripiprazole.

As with other antipsychotic drugs, aripiprazole should be used cautiously in patients who have a history of seizure disorder or have conditions associated with seizures.

## **Cerebrovascular Adverse Events, Including Stroke, in Elderly Patients with Dementia-Related Psychosis**

In placebo-controlled clinical studies (2 flexible dose and 1 fixed dose study) of dementia-related psychosis, there was an increased incidence of cerebrovascular adverse events (e.g., stroke, transient ischemic attack), including fatalities, in aripiprazole-treated patients (mean age: 84 years; range: 78-88 years). In the fixed dose study, there was a statistically significant dose response relationship for cerebrovascular adverse events in patients treated with aripiprazole. Aripiprazole is not approved for the treatment of patients with dementia-related psychosis. (See also **Section 4.4, SPECIAL WARNINGS AND PRECAUTIONS FOR USE: Increased Mortality in Elderly Patients with Dementia-Related Psychosis and Use in Patients with Concomitant Illness: Safety Experience in Elderly Patients with Psychosis Associated with Alzheimer's disease.**)

## **Hyperglycaemia and Diabetes Mellitus**

Hyperglycaemia, in some cases extreme and associated with ketoacidosis or hyperosmolar coma or death, has been reported in patients with atypical antipsychotics including aripiprazole. Assessment of the relationship between atypical antipsychotic use and glucose abnormalities is complicated by the possibility of an increase background risk of diabetes mellitus in patients with schizophrenia and the increasing incidence of diabetes mellitus in the general population. Given these confounders, the relationship between atypical antipsychotic use and hyperglycaemia-related adverse events is not completely understood. However, epidemiological studies suggest an increased risk of treatment-emergent hyperglycaemia-related adverse events in patients treated with the atypical antipsychotics. Precise risk estimates for hyperglycaemia-related adverse events in patients treated with atypical antipsychotics are not available.

Patients with an established diagnosis of diabetes mellitus who are started on atypical antipsychotics should be monitored regularly for worsening of glucose control. Patients with risk factors for diabetes mellitus (e.g. obesity, family history of diabetes) who are starting treatment with atypical antipsychotics should undergo fasting blood glucose testing at the beginning of treatment and periodically during treatment. Any patient treated with atypical antipsychotics should be monitored for symptoms of hyperglycaemia including polydipsia, polyuria, polyphagia, and weakness. Patients who develop symptoms of hyperglycaemia during treatment with atypical antipsychotics should undergo fasting blood glucose testing. In some cases, hyperglycaemia has resolved when the atypical antipsychotic was discontinued; however, some patients required continuation of anti-diabetic treatment despite discontinuation of the suspect drug.

In patients with significant treatment-emergent hyperglycaemia, discontinuation of aripiprazole should be considered.

## **Cardiovascular Adverse Events**

Potentially due to its  $\alpha_1$ -adrenergic receptor antagonism, aripiprazole may be associated with orthostatic hypotension.

The incidence of orthostatic hypotension-associated events from short-term, placebo-controlled trials of adult patients on oral aripiprazole (n=2467) included (aripiprazole incidence, placebo incidence): orthostatic hypotension (1%, 0.3%), postural dizziness (0.5%, 0.3%), and syncope (0.5%, 0.4%).

Orthostatic hypotension occurred in 0.8% (112/13543) of oral aripiprazole-treated patients during clinical trials.

As with other atypical antipsychotics, aripiprazole should be used with caution in patients with known cardiovascular disease (history of myocardial infarction or ischaemic heart disease, heart failure or conduction abnormalities), cerebrovascular disease or conditions which would predispose patients to hypotension (dehydration, hypovolaemia, and treatment with antihypertensive medications).

Cases of venous thromboembolism (VTE) have been reported with antipsychotic drugs. Since patients treated with antipsychotics often present with acquired risk factors for VTE, all possible risk factors for VTE should be identified before treatment with aripiprazole and preventive measures undertaken.

### **Body Temperature Regulation**

Disruption of the body's ability to increase or reduce core body temperature has been attributed to antipsychotic agents, including aripiprazole. Appropriate care is advised when prescribing aripiprazole for patients who will be experiencing conditions which may contribute to an elevation in core body temperature, e.g., exercising strenuously, exposure to extreme heat, receiving concomitant medication with anticholinergic activity, or being subject to dehydration.

Patients should be advised regarding appropriate care in avoiding overheating and dehydration.

### **Dysphagia**

Oesophageal dysmotility and aspiration have been associated with antipsychotic drug use. Aripiprazole and other antipsychotic drugs should be used cautiously in patients at risk of aspiration pneumonia (e.g. elderly patients).

### **Akathisia**

*Class effect:* The presentation of akathisia may be variable and comprises subjective complaints of restlessness and an overwhelming urge to move and either distress or motor phenomena such as pacing, swinging of the legs while seated, rocking from foot to foot, or both. Particular attention should be paid to the monitoring for such symptoms and signs as, left untreated, akathisia is associated with poor compliance and an increased risk of relapse.

### **Leucopenia, Neutropenia and Agranulocytosis**

*Class Effect:* In clinical trial and/or postmarketing experience, events of leucopenia/neutropenia have been reported temporally related to antipsychotic agents, including aripiprazole. Agranulocytosis has also been reported.

Possible risk factors for leucopenia/neutropenia include pre-existing low white blood cell count (WBC) and history of drug-induced leucopenia/neutropenia. Patients with a history of a clinically significant low WBC or drug-induced leucopenia/neutropenia should have their complete blood cell (CBC) monitored frequently during the first few months of therapy and discontinuation of aripiprazole

should be considered at the first sign of a clinically significant decline in WBC in the absence of other causative factors.

Patients with clinically significant neutropenia should be carefully monitored for fever or other symptoms or signs of infection and treated promptly if such symptoms or signs occur. Patients with severe neutropenia (absolute neutrophil count  $<1000/\text{mm}^3$ ) should discontinue aripiprazole and have their WBC followed until recovery.

### **Potential for Cognitive and Motor Impairment**

Aripiprazole, like other antipsychotics, may have the potential to impair judgment, thinking, or motor skills. In short-term, placebo-controlled trials, somnolence (including sedation) was reported as follows (aripiprazole incidence, placebo incidence): in adult patients (n=2467) treated with oral aripiprazole (11%, 6%). Somnolence (including sedation) led to discontinuation in 0.3% (8/2467) of adult patients on oral aripiprazole in short-term, placebo-controlled trials.

Despite the relatively modest increased incidence of these events compared to placebo, patients should be cautioned about operating hazardous machinery, including automobiles, until they are reasonably certain that therapy with aripiprazole does not affect them adversely.

### **Pathological gambling and impulse-control disorders**

Patients can experience increased urges, particularly for gambling, and the inability to control these urges while taking aripiprazole. Other urges, reported include: increased sexual urges, compulsive spending, binge or compulsive eating, and other impulsive and compulsive behaviours. It is important for prescribers to ask patients or their caregivers specifically about the development of new or increased gambling urges, sexual urges, compulsive spending, binge or compulsive eating, or other urges while being treated with aripiprazole. It should be noted that impulse-control symptoms can be associated with the underlying disorder; however, in some cases urges were reported to have stopped when the dose was reduced or the medication was discontinued. Impulse control disorders may result in harm to the patient and others if not recognized. Consider dose reduction or stopping the medication if a patient develops such urges while taking aripiprazole. (See Section 4.8, **ADVERSE EFFECTS (UNDESIRABLE EFFECTS.)**)

### **Lactose**

This medicinal product contains lactose. Patients with rare hereditary problems of galactose intolerance, the Lapp lactase deficiency or glucose-galactose malabsorption should not take this medicine.

### **Use in Patients with Concomitant Illness**

Clinical experience with aripiprazole in patients with certain concomitant systemic illnesses is limited. (See Section 5.1, **PHARMACOKINETIC PROPERTIES, PHARMACOLOGY: Renal Impairment and Hepatic Impairment**). Aripiprazole has not been evaluated or used to any appreciable extent in patients with a recent history of myocardial infarction or unstable heart disease. Patients with these diagnoses were excluded from premarketing clinical studies.

*Safety Experience in Elderly Patients with Psychosis Associated with Alzheimer's Disease:* In three, 10-week, placebo-controlled studies of aripiprazole in elderly patients with psychosis associated with Alzheimer's disease (n=938; mean age: 82.4 years; range: 56-99 years), the treatment-emergent adverse events that were reported at an incidence of  $\geq 5\%$  and aripiprazole incidence at least twice that for placebo were lethargy [placebo 2%, aripiprazole 5%], somnolence (including sedation) [placebo 3%, aripiprazole 8%] and incontinence ( primarily, urinary incontinence) [ placebo 1%, aripiprazole 5%].

The safety and efficacy of aripiprazole in the treatment of patients with psychosis associated with dementia have not been established. Aripiprazole is not indicated for the treatment of psychosis associated with Alzheimer's disease. (See also Section 4.4, **SPECIAL WARNINGS AND PRECAUTIONS FOR USE: Increased Mortality in Elderly Patients with Dementia-Related Psychosis and Cerebrovascular Adverse Events, Including Stroke, in Elderly Patients with Dementia-Related Psychosis.**)

#### **Concomitant Medication**

Patients should be advised to inform their physicians if they are taking, or plan to take, any prescription or over-the-counter drugs, since there is a potential for interactions. (See Section 4.4, **SPECIAL WARNINGS AND PRECAUTIONS FOR USE**, Section 4.5, **INTERACTIONS WITH OTHER MEDICINES AND OTHER FORMS OF INTERACTION** and Section 4.2, **DOSE AND METHOD OF ADMINISTRATION – CONCOMITANT MEDICATION**)

#### **Use in hepatic impairment**

Refer to **Section 5.1, Pharmacokinetic Properties**

#### **Use in renal impairment**

Refer to **Section 5.1, Pharmacokinetic Properties**

#### **Use in the elderly**

Placebo-controlled studies of aripiprazole in schizophrenia or Bipolar Mania did not include sufficient numbers of subjects aged 65 and over to determine whether they respond differently from younger subjects. Of the 13,543 patients treated with oral aripiprazole in clinical trials, 1073 (8%) were  $\geq 65$  years old and 799 (6%) were  $\geq 75$  years old. The majority (81%) of the 1073 patients were diagnosed with Dementia of the Alzheimer's Type.

Studies of elderly patients with psychosis associated with Alzheimer's disease have suggested that there may be a different tolerability profile in this population compared to younger patients with schizophrenia (see Section 4.4, **SPECIAL WARNINGS AND PRECAUTIONS FOR USE: Increased Mortality in Elderly Patients with Dementia-Related Psychosis and Cerebrovascular Adverse Events, Including Stroke, in Elderly Patients with Dementia-Related Psychosis and Use in Patients with Concomitant Illness**). The safety and efficacy of aripiprazole in the treatment of patients with psychosis associated with Alzheimer's disease has not been established. Aripiprazole is not indicated for the treatment of psychosis associated with Alzheimer's disease.

Of the 749 patients treated with aripiprazole injection in clinical trials, 99 (13%) were  $\geq 65$  years old and 78 (10%) were  $\geq 75$  years old. Almost all of the use in the elderly was in clinical trials for an indication for which

registration has not been requested. Placebo-controlled studies of aripiprazole injection in patients with agitation associated with schizophrenia did not include sufficient numbers of subjects aged 65 and over to determine whether they respond differently from younger subjects.

There was no effect of age on the pharmacokinetics of a single, 15 mg dose of aripiprazole. Aripiprazole clearance was decreased by 20% in elderly subjects ( $\geq 65$  years) compared to younger adult subjects (18 to 64 years), but there was no detectable effect of age in the population pharmacokinetic analysis in schizophrenia patients.

### **Paediatric use**

The safety and efficacy of aripiprazole in patients less than 18 years of age have not been established.

### **Effects on laboratory tests**

Refer to **Section 4.8 – Adverse Effects, Laboratory Test Abnormalities**

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

### ***CNS Drugs (including Alcohol)***

Given the primary CNS effects of aripiprazole, caution should be used when aripiprazole is taken in combination with other centrally acting drugs and alcohol.

Patients should be advised to avoid alcohol while taking aripiprazole.

Co-administration of **lithium** titrated upwards from a starting dose of 900 mg until serum lithium concentrations near the upper end of the lithium therapeutic concentration range (1.0–1.4 mmol/L) were achieved and maintained for at least 5 days or until dose-limiting adverse events were observed and **valproate** (divalproex sodium) titrated upwards from a starting dose of 250 mg twice daily to achieve serum concentrations within the therapeutic range of 50–125 µg/mL for at least 14 days, with 30 mg aripiprazole once daily had no clinically significant effects on the pharmacokinetics of aripiprazole. Nor was there any clinically significant change in valproic acid or **lithium** pharmacokinetics when aripiprazole 30 mg once daily was administered concomitantly for 7 days with either divalproex sodium 500 mg every 12 hours or controlled release lithium 450 mg every 12 hours.

When aripiprazole was administered concomitantly with either valproate, lithium or lamotrigine, there was no clinically important change in valproate, lithium or lamotrigine concentrations.

### ***Antihypertensive Agents***

Due to its  $\alpha_1$ -adrenergic receptor antagonist activity, aripiprazole has the potential to enhance the effect of certain antihypertensive agents.

### ***Medicines which cause QT prolongation or electrolyte imbalance***

If aripiprazole is administered concomitantly with medicinal products known to cause QT prolongation or electrolyte imbalance, caution should be used.

### ***Inhibitors and Inducers of CYP2D6 & CYP3A4***

Aripiprazole is metabolized by multiple pathways primarily involving the CYP2D6 and CYP3A4 enzymes. In clinical studies with healthy subjects, potent inhibitors of CYP2D6 (**quinidine**) and 3A4 (**ketoconazole**) decreased oral clearance of aripiprazole by 52% and 38%, respectively. Other potent inhibitors of CYP3A4 and CYP2D6 may be expected to have similar effects. When concomitant administration of quinidine or ketoconazole with aripiprazole occurs, the aripiprazole dose should be halved. When the inhibitor is withdrawn from the combination therapy, the aripiprazole dose should then be increased. (See **Section 4.2, DOSE & METHOD OF ADMINISTRATION – Concomitant Medication**)

No data are available for use of aripiprazole with other inhibitors of CYP3A4 or CYP2D6. Examples of medicines or substances that have the potential to inhibit CYP3A4 or CYP2D6 include, but are not limited to, clarithromycin, erythromycin, itraconazole, fluconazole, ritonavir, indinavir, nefazodone, cyclosporin, amiodarone, cimetidine, fluoxetine, paroxetine and grapefruit juice.

Dose reduction of aripiprazole should be applied with concomitant administration of potent CYP3A4 inhibitors such as itraconazole, clarithromycin and HIV protease inhibitors, as similar effects to that seen in the clinical studies with ketoconazole may be expected. Dose reduction of aripiprazole should be applied with concomitant administration of potent CYP2D6 inhibitors such as fluoxetine and paroxetine as similar effects to that seen in the clinical studies with quinidine may be expected (**see Section 4.2, DOSE & METHOD OF ADMINISTRATION – Concomitant Medications**).

In a clinical study in patients with schizophrenia or schizo-affective disorder, co-administration of **carbamazepine** (200 mg twice daily), a potent CYP3A4 inducer, with aripiprazole (30 mg daily) resulted in an approximate 70% decrease in AUC values of both aripiprazole and its active metabolite, dehydro-aripiprazole. Other potent inducers of CYP3A4 and CYP2D6 may be expected to have similar effects. When a potent inducer like carbamazepine is added to aripiprazole therapy, the aripiprazole dose should be increased. Other potent inducers of CYP3A4 include, but are not limited to, St Johns Wort, phenytoin, rifampicin, efavirenz, and nevirapine. Additional dose increases should be based on clinical evaluation. When the inducer is withdrawn from the combination therapy, the aripiprazole dose should then be reduced. (See **Section 4.2, DOSE & METHOD OF ADMINISTRATION – Dosage adjustment for patients taking CYP3A4 inducers**)

### ***Inhibitors and Inducers of CYP1A1, CYP1A2, CYP2C9, and CYP2C19***

Aripiprazole is not metabolized by CYP1A1, CYP1A2, CYP2C9, and CYP2C19 in vitro, suggesting that interactions with medications or other factors (e.g., smoking), which are inhibitors or inducers of these enzymes, are unlikely.

### ***Effects of Aripiprazole on Substrates for CYP2D6, CYP2C9, CYP2C19, CYP3A4, & CYP1A2***

Aripiprazole and dehydro-aripiprazole were weak inhibitors of CYP2C9, CYP2C19, CYP2D6, and CYP3A4-mediated metabolism in vitro (IC<sub>50</sub> values 2.4–25 µM). Neither aripiprazole nor dehydro-aripiprazole inhibited CYP1A2-mediated metabolism in vitro (IC<sub>50</sub> value >50–66 µM).

In clinical studies, 10-30 mg/day doses of aripiprazole had no significant effect on metabolism of substrates of CYP2D6 (**dextromethorphan**), CYP2C9 (**warfarin**), CYP2C19 (**omeprazole, warfarin**), and

CYP3A4 (**dextromethorphan**). Thus, aripiprazole is unlikely to cause clinically important drug interactions mediated by these enzymes.

### **Famotidine**

There was no significant effect of the H<sub>2</sub> antagonist famotidine, a potent gastric acid blocker, on the pharmacokinetics of aripiprazole.

### **Food**

Aripiprazole can be administered without regard to meals. Following administration of a 15 mg aripiprazole tablet with a standard high-fat meal, the C<sub>max</sub> of aripiprazole and its active metabolite, dehydro-aripiprazole, increased by 11%. The AUC of aripiprazole was increased by 18% and that of the active metabolite by 14%. Food delayed T<sub>max</sub> by 3 hours for aripiprazole and 12 hours for the active metabolite.

## **4.6 FERTILITY, PREGNANCY AND LACTATION**

### **Effects on fertility**

Aripiprazole had no effect on fertility in female rats treated orally with 2, 6, and 20 mg/kg/day (0.6, 2, and 6 times the MRHD based on mg/m<sup>2</sup>) for 2 weeks prior to mating through gestation day 7. Drug-related effects (persistent dioestrus and increased mating time pre-implantation losses, and corpora lutea) observed at all doses were considered the result of perturbed oestrous cyclicity secondary to drug-mediated hyperprolactinaemia.

Aripiprazole had no effect on fertility in male rats treated with PO doses of 20, 40, and 60 mg/kg/day (6, 12, and 18 times the MRHD based on mg/m<sup>2</sup>) for 9 weeks prior to mating through mating. Disturbances of spermatogenesis were seen at 60 mg/kg/day and prostatic atrophy was seen at 40 and 60 mg/kg/day.

### **Use in pregnancy – Pregnancy Category C**

Congenital anomalies have been reported; however, a causal relationship with aripiprazole could not be established. In animal studies aripiprazole demonstrated developmental toxicity, including possible teratogenic effects, in rats and rabbits.

Pregnant rats were treated with oral doses of 3, 10, and 30 mg/kg/day (1, 3, and 9 times the MRHD on a mg/m<sup>2</sup> basis) of aripiprazole during the period of organogenesis. At 30 mg/kg, treatment was associated with slightly prolonged gestation, and a slight delay in foetal development as evidenced by decreased foetal weight, undescended testes, and delayed skeletal ossification. There were no adverse effects on embryofoetal or pup survival. Delivered offspring had increased incidences of hepatodiaphragmatic nodules and diaphragmatic hernia at 30 mg/kg (the other doses were not examined for these findings). (A low incidence of diaphragmatic hernia was also seen in the foetuses exposed to 30 mg/kg). Postnatally, decreased pup weight (persisting into adulthood) was seen at 30 mg/kg, delayed vaginal opening was seen at 10 and 30 mg/kg, and impaired reproductive performance (decreased fertility rate, corpora lutea, implants, and live foetuses, and increased post-implantation loss, likely mediated through effects on female offspring) was seen at 30 mg/kg. Maternal toxicity was seen at 30 mg/kg, which was similar to doses eliciting embryotoxicity.

Pregnant rabbits were treated with oral doses of 10, 30, and 100 mg/kg/day (2, 3, and 11 times human exposure at MRHD based on AUC and 8, 24, and 81 times the MRHD based on mg/m<sup>2</sup>) of aripiprazole during the period of organogenesis. Decreased maternal food consumption, and increased abortions were seen at 100 mg/kg. Treatment caused increased foetal mortality (100 mg/kg), decreased foetal weight (30 mg and 100 mg/kg), increased incidence of a skeletal abnormality (fused sternbrae at 100 mg/kg) and minor skeletal variations (100 mg/kg).

Rats were treated with oral doses of 3, 10, and 30 mg/kg/day (1, 3, and 9 times the MRHD on a mg/m<sup>2</sup> basis) of aripiprazole from late gestation through weaning. At 30 mg/kg, maternal toxicity, slightly prolonged gestation, an increase in stillbirths, poor postnatal care/nursing, and decreases in pup weight (persisting into adulthood) and survival were seen.

*Non-teratogenic class effect:* Neonates exposed to antipsychotic drugs (including aripiprazole) during the third trimester of pregnancy are at risk of experiencing extrapyramidal neurological disturbances and/or withdrawal symptoms following delivery. There have been post-market reports of agitation, hypertonia, hypotonia, tremor, somnolence, respiratory distress, and feeding disorder in these neonates. These complications have varied in severity; while in some cases symptoms have been self-limited, in other cases neonates have required additional medical treatment or monitoring.

Aripiprazole should be used during pregnancy only if the anticipated benefit outweighs the risk and the administered dose and duration of treatment should be as low and as short as possible.

Patients should be advised to notify their doctors if they become pregnant or intend to become pregnant.

#### ***Use in Labour and Delivery***

The effect of aripiprazole on labour and delivery has not been studied.

#### **Use in lactation.**

Aripiprazole and/or its metabolites have been found in the milk of lactating rats. Aripiprazole is excreted in breast milk. Patients should be advised not to breast-feed if they are taking aripiprazole.

#### **4.7 EFFECTS ON ABILITY TO DRIVE AND USE MACHINES**

As with other antipsychotics, patients should be cautioned about operating hazardous machinery, including motor vehicles, until they are reasonably certain that aripiprazole does not affect them adversely.

#### **4.8 ADVERSE EFFECTS (UNDESIRABLE EFFECTS)**

##### **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 [www.tga.gov.au/reporting-problems](http://www.tga.gov.au/reporting-problems).

Aripiprazole has been evaluated for safety in 13543 patients who participated in multiple-dose clinical

trials in Schizophrenia (including schizo-affective disorder), Bipolar I Disorder, Major Depressive Disorder, Dementia of the Alzheimer's type, Parkinson's disease, and alcoholism, and who had approximately 7619 patient-years of exposure to oral aripiprazole and 749 patients with exposure to aripiprazole injection. A total of 3390 patients were treated with oral aripiprazole for at least 180 days and 1933 patients treated with oral aripiprazole had at least 1 year of exposure.

The conditions and duration of treatment with aripiprazole (monotherapy and in combination treatment with lithium or valproate) included (in overlapping categories) double-blind, comparative and non-comparative open-label studies, inpatient and outpatient studies, fixed- and flexible-dose studies, and short- and longer- term exposure.

Adverse events during exposure were obtained by collecting voluntarily reported adverse events, as well as results of physical examinations, vital signs, weights, laboratory analyses, and ECG. Adverse experiences were recorded by clinical investigators using terminology of their own choosing. In the tables and tabulations that follow, MedDRA dictionary terminology has been used initially to classify reported adverse events into a smaller number of standardized event categories, in order to provide a meaningful estimate of the proportion of individuals experiencing adverse events.

The stated frequencies of adverse events represent the proportion of individuals who experienced, at least once, a treatment-emergent adverse event of the type listed. An event was considered treatment-emergent if it occurred for the first time or worsened while receiving therapy following baseline evaluation.

The prescriber should be aware that the figures in the tables and tabulations cannot be used to predict the incidence of side effects in the course of usual medical practice where patient characteristics and other factors differ from those that prevailed in the clinical trials. Similarly, the cited frequencies cannot be compared with figures obtained from other clinical investigations involving different treatment uses and investigators. The cited figures, however, do provide the prescribing physician with some basis for estimating the relative contribution of drug and nondrug factors to the adverse event incidence in the population studied.

## **Oral Administration**

### ***Adult Patients with Schizophrenia***

#### ***Adverse Events Associated with Discontinuation of Treatment in Short-Term, Placebo-Controlled Trials of Patients with Schizophrenia***

Based on a pool of five placebo-controlled trials (four 4-week and one 6-week) in which aripiprazole was administered to acutely relapsed patients with schizophrenia in doses ranging from 2 to 30 mg/day, there was no difference in the incidence of discontinuation due to adverse events between aripiprazole-treated (7%) and placebo-treated (9%) patients. The types of adverse events that led to discontinuation were similar between the aripiprazole- and placebo-treated patients.

## **Adult Patients with Bipolar I Disorder**

### Monotherapy

The following findings are based on a pool of 3-week, placebo-controlled, Bipolar I Disorder trials in which oral aripiprazole was administered at doses of 15 mg/day or 30 mg/day.

### *Adverse Reactions Associated with Discontinuation of Treatment*

Overall, in patients with Bipolar I Disorder, there was little difference in the incidence of discontinuation due to adverse reactions between aripiprazole-treated (11%) and placebo-treated (10%) patients. The types of adverse reactions that led to discontinuation were similar between aripiprazole-treated and placebo-treated patients.

### *Commonly Observed Adverse Reactions*

Commonly observed adverse reactions associated with the use of aripiprazole in patients with Bipolar I Disorder (incidence of 5% or greater and aripiprazole incidence at least twice that for placebo) are shown in the following Table:

**Table 1: Commonly Observed Adverse Reactions in Short-Term, Placebo-Controlled Trials of Adult Patients with Bipolar I Disorder Treated with Oral Aripiprazole Monotherapy**

Preferred Term	Percentage of Patients Reporting Reaction	
	Aripiprazole (n=917)	Placebo (n=753)
Akathisia	13	4
Sedation	8	3
Restlessness	6	3
Tremor	6	3
Extrapyramidal Disorder	5	2

### Less Common Adverse Reactions in Adults

*Adverse Events Occurring at an Incidence of at Least 2% among Aripiprazole-Treated Patients in Short-Term Placebo-Controlled Trials*

**Table 2** enumerates the pooled incidence, rounded to the nearest percent, of treatment-emergent adverse events that occurred during acute therapy (up to 6 weeks in Schizophrenia and up to 3 weeks in Bipolar Mania), 2 or more of patients treated with aripiprazole (doses  $\geq 2$  mg/day) and for which the incidence in patients treated with aripiprazole was greater than the incidence in patients treated with placebo in the combined dataset.

**Table 2: Adverse Reactions in Short-Term, Placebo-Controlled Trials in Adult Patients Treated with Oral Aripiprazole**

System Organ Class Preferred Term	Percentage of patients Reporting Reaction <sup>a</sup>	
	Aripiprazole (n=1843)	Placebo (n=1166)
<b>Eye Disorders</b>		
Blurred Vision	3	1
<b>Gastrointestinal Disorders</b>		
Nausea	15	11
Constipation	11	7
Vomiting	11	6
Dyspepsia	9	7
Dry Mouth	5	4
Toothache	4	3
Abdominal Discomfort	3	2
Stomach Discomfort	3	2
<b>General Disorders and Administration Site Conditions</b>		
Fatigue	6	4
Pain	3	2
<b>Musculoskeletal and Connective Tissue Disorders</b>		
Musculoskeletal Stiffness	4	3
Pain in Extremity	4	2
Myalgia	2	1
Muscle Spasm	2	1
<b>Nervous System Disorders</b>		
Headache	27	23
Dizziness	10	7
Akathisia	10	4
Sedation	7	4
Extrapyramidal Disorder	5	3
Tremor	5	3
Somnolence	5	3
<b>Psychiatric Disorders</b>		
Agitation	19	17
Insomnia	18	13
Anxiety	17	13
Restlessness	5	3
<b>Respiratory, Thoracic, and Mediastinal Disorders</b>		
Pharyngolaryngeal Pain	3	2
Cough	3	2

<sup>a</sup>Adverse reactions reported by at least 2% of patients treated with oral aripiprazole, except adverse reactions which had an incidence equal to or less than placebo.

An examination of population subgroups did not reveal any clear evidence of differential adverse reaction incidence on the basis of age, gender, or race.

### **Adult Patients with Adjunctive Therapy with Bipolar I Disorder**

The following findings are based on a placebo-controlled trial of adult patients with Bipolar I Disorder in which aripiprazole was administered at doses of 15 mg/day or 30 mg/day in combination with lithium or valproate.

#### *Adverse Reactions Associated with Discontinuation of Treatment*

In a study of patients who were already tolerating either lithium or valproate as monotherapy, discontinuation rates due to adverse reactions were 12% for patients treated with adjunctive aripiprazole compared with 6% for patients treated with adjunctive placebo. The most common adverse drug reactions associated with discontinuation in the adjunctive aripiprazole-treated compared to placebo-treated patients were akathisia (5% and 1%, respectively) and tremor (2% and 1%, respectively).

#### *Commonly Observed Adverse Reactions*

The commonly observed adverse reactions associated with adjunctive aripiprazole and lithium or valproate in patients with Bipolar I Disorder (incidence of 5% or greater and incidence at least twice that for adjunctive placebo) were: akathisia, insomnia, and extrapyramidal disorder.

#### *Less Common Adverse Reactions in Adults with Adjunctive Therapy in Bipolar I Disorder*

**Table 3** enumerates the incidence, rounded to the nearest percent, of adverse reactions that occurred during acute treatment (up to 6 weeks), including only those reactions that occurred in 2% or more of patients treated with adjunctive aripiprazole (doses of 15 mg/day or 30 mg/day) and lithium or valproate and for which the incidence in patients treated with this combination was greater than the incidence in patients treated with placebo plus lithium or valproate.

**Table 3: Adverse Reactions in a Short-Term, Placebo-Controlled Trial of combination therapy with lithium or valproate in Patients with Bipolar I Disorder**

System Organ Class	Percentage of Patients Reporting Reaction <sup>a</sup>	
	Aripiprazole + Lithium or Valproate (n=253)	Placebo + Lithium or Valproate (n=130)
<b>Gastrointestinal Disorders</b>		
Nausea	8	5
Vomiting	4	0
Salivary Hypersecretion	4	2
Dry Mouth	2	1
<b>Infections and Infestations</b>		
Nasopharyngitis	3	2
<b>Investigations</b>		
Weight increased	2	1
<b>Nervous System Disorders</b>		
Akathisia	19	5
Tremor	9	6
Extrapyramidal Disorder	5	1

Dizziness	4	1
Sedation	4	2
<b>Psychiatric Disorders</b>		
Insomnia	8	4
Anxiety	4	1
Restlessness	2	1

<sup>a</sup>Adverse reactions reported by at least 2% of patients treated with oral aripiprazole, except adverse reactions which had an incidence equal to or less than placebo

#### *Dose-Related Adverse Events in Short-Term, Placebo-Controlled Trials in Schizophrenia*

Dose response relationships for the incidence of treatment-emergent adverse events were evaluated from four trials comparing fixed doses (2, 10, 15, 20, and 30 mg/day) of aripiprazole to placebo. This analysis, stratified by study, indicated that the only adverse event to have a possible dose response relationship, and then most prominent only with 30 mg, was somnolence (including sedation) [placebo, 7.1%; 10 mg, 8.5%, 15 mg, 8.7 %; 20 mg, 7.5%; 30 mg, 12.6%].

#### *Adverse Events Occurring in Long-Term Controlled Trials*

The adverse events reported in a 26-week, double-blind trial comparing aripiprazole and placebo in patients with schizophrenia were generally consistent with those reported in the short-term, placebo-controlled trials, except for a higher incidence of tremor [8% (12/153) for aripiprazole vs. 2% (3/153) for placebo]. In this study, the majority of the cases of tremor were of mild intensity (8/12 mild and 4/12 moderate), occurred early in therapy (9/12  $\leq$ 49 days), and were of limited duration (7/12  $\leq$ 10 days). Tremor infrequently led to discontinuation (<1%) of aripiprazole. In addition, in a long-term (52-week), active-controlled study, the incidence of tremor for aripiprazole was 5% (40/859). A similar profile was observed in a long-term study in Bipolar I Disorder.

#### Weight Gain

In placebo-controlled trials, there was a slight difference in mean weight change between aripiprazole and placebo patients (+0.7 kg vs -0.05 kg, respectively, in short-term studies;  $p \leq 0.01$ , and -1.3 kg vs -0.9 kg, respectively, in 26 week study;  $p = n.s.$ ) and also a difference in the proportion of patients meeting the significant weight gain criterion of  $\geq 7\%$  of body weight (aripiprazole 8% compared to placebo 3% in short-term studies;  $p \leq 0.01$ ; and aripiprazole 6% compared to placebo 4% in long-term studies;  $p = n.s.$ ).

In 3-week trials in adults with Bipolar I Disorder with monotherapy aripiprazole, the mean weight gain for aripiprazole and placebo patients was 0.1 kg versus 0.0 kg, respectively. The proportion of patients meeting a weight gain criterion of  $\geq 7\%$  of body weight was aripiprazole (2%) compared to placebo (3%). In the 6-week trial in Bipolar I Disorder with aripiprazole as adjunctive therapy with either lithium or valproate, the mean weight gain for aripiprazole and placebo patients was 0.6 kg versus 0.2 kg, respectively. The proportion of patients meeting a weight gain criterion of  $\geq 7\%$  of body weight with adjunctive aripiprazole was 3% compared to adjunctive placebo 4%.

In long-term, double-blind, active-comparator trials in schizophrenia, aripiprazole was associated with a higher incidence of significant weight gain ( $\geq 7\%$  above baseline) compared with haloperidol (20% vs 13%, respectively;  $p \leq 0.01$ ; 1.1 kg vs 0.4 kg, respectively;  $p = n.s.$ ) but a lower incidence of significant

weight gain compared to olanzapine (aripiprazole 13% vs olanzapine 33%; p<0.001; -0.9 kg vs 3.4 kg; p<0.001 in a double-blind study).

Weight change results (see **Table 4**) from long-term, double-blind, controlled trials in schizophrenia showed that patients with high body mass index (BMI) (>27) were less likely to have significant weight gain on aripiprazole than those with low BMI (<2

<b>Study</b>		<b>BMI &lt;23</b>	<b>BMI 23-27</b>	<b>BMI &gt;27</b>
52-week Haloperidol Controlled	Mean Change from Baseline (kg)	2.6	1.4	-1.2
	% Patients with ≥7% increase of body weight relative to baseline	30%	19%	8%
26-week Olanzapine Controlled	Mean Change from Baseline (kg)	1.2	-0.4	-1.4
	% Patients with ≥7% increase of body weight relative to baseline	21%	7%	11%
26-week Placebo Controlled	Mean Change from Baseline (kg)	-0.5	-1.3	-2.1
	% Patients with ≥7% increase of body weight relative to baseline	7%	5%	6%

### Extrapyramidal Symptoms

In the short-term, placebo-controlled trials of schizophrenia in adults, the incidence of reported EPS-related events excluding events related to akathisia for aripiprazole-treated patients was 13% vs. 12% for placebo. The incidence of akathisia-related events for aripiprazole-treated patients was 8% vs 5% for placebo-treated patients.

In the short-term, placebo-controlled trials in Bipolar I Disorder in adults, the incidence of reported EPS-related events, excluding events related to akathisia, for monotherapy aripiprazole-treated patients was 16% versus 8% for placebo and the incidence of akathisia-related events for monotherapy aripiprazole-treated patients was 13% versus 4% for placebo. In the 6-week, placebo-controlled trial in Bipolar I Disorder for combination therapy with lithium or valproate, the incidence of reported EPS-related events, excluding events related to akathisia for patients treated with aripiprazole in combination with lithium or valproate was 15% versus 8% for patients treated with aripiprazole and placebo and the incidence of akathisia-related events for patients treated with aripiprazole in combination with lithium or valproate was 19% versus 5% for patients treated with aripiprazole and

placebo.

Objectively collected data from those trials on the Simpson Angus Rating Scale (for EPS), the Barnes Akathisia Scale (for akathisia), and the Assessments of Involuntary Movement Scales (for dyskinesias) did not show a difference between aripiprazole and placebo, with the exception of the Barnes Akathisia Scale (aripiprazole, 0.08; placebo, -0.05).

In the adult Bipolar I Disorder trials with monotherapy aripiprazole, The Simpson Angus Rating Scale and the Barnes Akathisia Scale showed a significant difference between aripiprazole and placebo (aripiprazole, 0.50; placebo, -0.01 and aripiprazole, 0.21; placebo, -0.05). Changes in the Assessment of Involuntary Movement Scales were similar for the aripiprazole and placebo groups. In the Bipolar I Disorder trials with aripiprazole in combination with either lithium or valproate, The Simpson Angus Rating Scale and the Barnes Akathisia Scale showed a significant difference between adjunctive aripiprazole and combination therapy placebo (aripiprazole, 0.73; placebo, 0.07 and aripiprazole, 0.30; placebo, 0.11). Changes in the Assessment of Involuntary Movement Scales were similar for adjunctive aripiprazole and combination therapy placebo.

In a long-term, double-blind, haloperidol-controlled study in schizophrenia, the incidence of haloperidol-treated patients showing at least one EPS-related adverse event, including dystonia, was significantly greater than that of the aripiprazole group (57% vs 26%;  $p < 0.001$ ). In a long-term, double-blind, olanzapine-controlled study, the incidence of olanzapine-treated patients showing at least one EPS-related adverse event was comparable to aripiprazole-treated patients (15% vs 15%, respectively;  $p = \text{n.s.}$ ).

### Dystonia

*Class Effect:* Symptoms of dystonia, prolonged abnormal contractions of muscle groups, may occur in susceptible individuals during the first few days of treatment. Dystonic symptoms include: spasm of the neck muscles, sometimes progressing to tightness of the throat, swallowing difficulty, difficulty breathing, and/or protrusion of the tongue. While these symptoms can occur at low doses, they occur more frequently and with greater severity with high potency and at higher doses of first generation antipsychotic drugs. An elevated risk of acute dystonia is observed in males and younger age groups.

### ECG Changes

Between group comparisons for pooled, acute, placebo-controlled trials in patients with schizophrenia or Bipolar I Disorder revealed no significant differences between oral aripiprazole and placebo in the proportion of patients experiencing potentially important changes in ECG parameters. In fact, within the dose range of 10 to 30 mg/day, aripiprazole tended to slightly shorten the QTc interval. Aripiprazole was associated with a median increase in heart rate of two beats per minute compared to no increase among placebo patients.

In a 26-week, placebo-controlled trial in schizophrenia, there were no significant differences between aripiprazole and placebo in the proportion of patients experiencing potentially important changes in ECG parameters.

### Laboratory Test Abnormalities

A between group comparison for acute, 3 to 6-week, placebo-controlled trials in adults revealed no medically important differences between the aripiprazole and placebo groups in the proportions of patients experiencing potentially clinically significant changes in routine serum chemistry, haematology, or urinalysis parameters. Similarly, there were no aripiprazole/placebo differences in the incidence of discontinuations for changes in serum chemistry, haematology, or urinalysis in adult patients.

In a long-term (26-week), placebo-controlled trial, there were no statistically significant differences between the aripiprazole and placebo patients in the mean change from baseline in fasting glucose, triglyceride, LDL, and total cholesterol measurements.

### ***Adverse Reactions Observed During the Premarketing Evaluation of oral aripiprazole***

The following is a list of MedRA terms that reflect adverse reactions reported by adult patients treated with oral aripiprazole at multiple doses  $\geq 2$  mg/day during any phase of a trial within a database of 13,543 adult patients. The listing does not show adverse events mentioned in Table 1, 2 and 3 or in other sections of this prescribing information. It is important to emphasise that although the events reported occurred with treatment they are not necessarily caused by it. The adverse reactions are classified by system organ class and are according to the following definitions: common adverse reactions are those occurring in at least 1/100 patients; uncommon adverse reactions are those occurring in at least 1/1000, but less than 1/100 patients; rare adverse reactions are those occurring in less than 1/1000 patients.

**Blood and Lymphatic System Disorders:** *uncommon*: leukopenia, neutropenia, thrombocytopenia; *rare* – eosinophilia, lymphadenopathy

**Cardiac Disorders:** *uncommon* – bradycardia, palpitations; cardiopulmonary failure, myocardial infarction, cardio-respiratory arrest, atrioventricular block, extrasystoles, sinus tachycardia, atrial fibrillation, angina pectoris, myocardial ischaemia; *rare* - atrial flutter, supraventricular tachycardia, ventricular tachycardia.

**Ear and Labyrinth Disorders:** *rare* - ear canal erythema, hypoacusis, vertigo positional, tinnitus.

**Endocrine Disorders:** *rare* - early menarche.

**Eye Disorders:** *uncommon* - dry eye; photophobia, diplopia, eyelid oedema, photopsia; *rare* - eye redness, chromatopsia, conjunctivitis, eye disorder, eye movement disorder, gaze palsy, lacrimation increased.

**Gastrointestinal Disorders:** *uncommon* - diarrhoea, gastritis, dysphagia, gastroesophageal reflux disease, swollen tongue, oesophagitis, hypoaesthesia oral; *rare* - abdominal distension, abnormal faeces, eructation, faeces discoloured, constipation, gastrointestinal disorder, gastrointestinal pain, glossitis, lip dry, parotid gland enlargement, pruritus ani, tongue discolouration, pancreatitis.

**General Disorders and Administration Site Conditions:** *common* – asthenia, peripheral oedema, irritability, chest pain; *uncommon* – face oedema, angiodema, gait disturbance, adverse event, chills, discomfort, feeling abnormal, mobility decreased; *rare* - difficulty in walking, facial pain, swelling, malaise, thirst, chest discomfort, cyst, energy increased, feeling cold, generalised oedema, local swelling, oedema, tenderness, xerosis, hypothermia.

**Hepatobiliary Disorders:** *rare* - hepatitis, jaundice.

**Immune System Disorders:** *rare* - decreased immune responsiveness, hypersensitivity.

**Infections and Infestations:** *rare* - sinusitis, urinary tract infection, body tinea, gastroenteritis viral, herpes simplex, localized infection, lower respiratory tract infection, oral candidiasis, parotitis, gastroenteritis.

**Injury, Poisoning, and Procedural Complications:** *common* - fall; *uncommon* – self mutilation; *rare* – *heat stroke*, injury, muscle strain, clavicle fracture, femoral neck fracture, hip fracture, humerus fracture, mouth injury, open wound. -

**Investigations:** *common* – weight decreased, creatinine phosphokinase increased; *uncommon* - weight increased, blood creatinine increased, heart rate increased, blood glucose increased, pyrexia, blood prolactin increased, blood urea increased, electrocardiogram QT prolonged, blood bilirubin increased, hepatic enzyme increased; *rare* - electrocardiogram abnormal, urine output increased, blood creatine phosphokinase abnormal, orthostatic hypotension, blood urine present, electrocardiogram PR prolongation, electrocardiogram T wave inversion, eosinophil count increased, head lag abnormal, heart rate irregular, physical examination, urine ketone body present, white blood cell count increased, blood lactate dehydrogenase increased, glycosylated haemoglobin increased, gamma-glutamyl transferase increased.

**Metabolism and Nutrition Disorders:** *uncommon* – hyperlipidaemia, anorexia, diabetes mellitus (including blood insulin increased, carbohydrate tolerance decreased, diabetes mellitus non-insulin-dependent, glucose tolerance impaired, glycosuria, glucose urine, glucose urine present), hyperglycaemia, hypokalaemia, hypoglycaemia, polydipsia; increased appetite, dehydration, hyponatraemia; *rare* - diabetic ketoacidosis, hyperuricaemia.

**Musculoskeletal and Connective Tissue Disorders:** *uncommon* –muscle rigidity, musculoskeletal rigidity, muscle tightness, muscle spasms, muscular weakness, mobility decreased; *rare* - bone pain, nuchal rigidity, sensation of heaviness, flank pain, jaw disorder, kyphosis, osteoarthritis, rhabdomyolysis.

**Neoplasms Benign, Malignant and Unspecified (Including Cysts and Polyps):** *rare* - oral neoplasm, skin papilloma.

**Nervous System Disorders:** *common* – coordination abnormal; *uncommon* – memory impairment, cerebrovascular accident, hypokinesia, hypotonia, myoclonus, hypertonia, akinesia, bradykinesia, drooling, cogwheel rigidity, dystonia, disturbance in attention, dizziness postural, dysarthria, paraesthesia, parkinsonism, psychomotor hyperactivity, hypoaesthesia, speech disorder, tardive

dyskinesia; **rare** - burning sensation, convulsion, depressed level of consciousness, dysgeusia, akinaesthesia, ataxia, bradykinesia, coma, dysphasia, facial palsy, judgement impaired, loss of consciousness, migraine, neuroleptic malignant syndrome, paraesthesia circumoral, sleep phase rhythm disturbance, Grand Mal convulsion, choreoathetosis, unresponsive to verbal stimuli.

**Psychiatric Disorders:** **common** – suicidal ideation; **uncommon** – aggression, loss of libido, suicide attempt, hostility, libido increased, anger, anorgasmia, delirium, intentional self injury, completed suicide, tic, homicidal ideation, depression, confusional state, nightmare, mania, abnormal dreams, hallucination auditory, nervousness, hallucination, apathy, thinking abnormal, bruxism; **rare** – catatonia, sleep walking, bradyphrenia, delirium, depressed mood, disorientation, euphoric mood, logorrhea, mental status changes, mood altered, panic attack, sleep disorder, blunted affect, cognitive deterioration, delusional perception, insomnia, eating disorder, emotional distress, impulsive behaviour, asthenia, mood swings, psychomotor retardation, somatoform disorder.

**Renal and Urinary Disorders:** **uncommon** – nocturia, polyuria, pollakiuria, incontinence, urinary retention; **rare** - proteinuria, bladder discomfort, chromaturia, enuresis, micturition urgency, oliguria, urethral discharge, urinary hesitation.

**Reproductive System and Breast Disorders:** **uncommon** – erectile dysfunction, amenorrhea<sup>f</sup>, breast pain, menstruation irregular<sup>f</sup>; **rare** - genital pruritus female<sup>f</sup>, vulvovaginal discomfort<sup>f</sup>, pelvic pain, breast discharge, sexual dysfunction, gynaecomastia, priapism.

**Respiratory, Thoracic and Mediastinal Disorders:** **common** – nasal congestion, dyspnea, pneumonia aspiration; **uncommon** - hiccups, epistaxis; **rare** - dry throat, rhinorrhoea, sinus congestion, hoarseness, nasal dryness, painful respiration, paranasal sinus hypersecretion.

**Skin and Subcutaneous Tissue Disorders:** **common** – rash (including erythematous, exfoliative, generalised, macular, maculopapular, popular rash, acneiform, allergic contact, exfoliative seborrheic dermatitis, neurodermatitis, and drug eruption), hyperhidrosis; **uncommon** - pruritus, photosensitivity reaction, alopecia, urticaria; **rare** - decubitus ulcer, face oedema, pemphigus, psoriasis, dry skin.

**Social Circumstances:** **rare** - smoker.

**Vascular Disorders:** **common** – hypertension; **uncommon** – hypotension, hot flush, **rare** - flushing, hyperaemia.

<sup>f</sup> (female) indicates incidence based on gender total

### **Postmarketing experience**

The following adverse reactions have been identified during post-approval use of aripiprazole. Because these reactions are reported voluntarily from a population of uncertain size, it is not always possible to establish a causal relationship to drug exposure: occurrences of allergic reaction (anaphylactic reaction, angioedema, laryngospasm, pruritis/urticaria, or oropharyngeal spasm), and blood glucose fluctuation. Very

rare occurrences of increased AST and increased ALT and hiccups have been reported.

**Psychiatric Disorders:** *uncommon* - hypersexuality; *unknown* - pathological gambling, impulse-control disorders, obsessive-compulsive disorders, eating disorders.

**Eye disorders:** *Not known* - Oculogyric crisis.

#### Drug abuse and dependence

Aripiprazole has not been systematically studied in humans for its potential for abuse, tolerance, or physical dependence. In self-administration studies in rats and monkeys, aripiprazole demonstrated marginal to no abuse potential. In physical dependence studies in rats and monkeys, modest withdrawal symptoms were observed upon abrupt cessation of dosing. While the clinical trials did not reveal any tendency for any drug-seeking behaviour, these observations were not systematic and it is not possible to predict on the basis of this limited experience the extent to which a CNS-active drug will be misused, diverted, and/or abused once marketed. Consequently, patients should be evaluated carefully for a history of drug abuse and such patients should be observed closely for signs of aripiprazole misuse or abuse (e.g., development of tolerance, increases in dose, drug-seeking behaviour).

## 4.9 OVERDOSE

### ***Human Experience***

In clinical studies, and post marketing experience accidental or intentional acute overdosage of aripiprazole alone was identified in adult patients with estimated doses up to 1260 mg with no fatalities. The potentially medically important signs and symptoms observed in adult patients who overdosed with aripiprazole alone at doses up to 1260 mg included lethargy, blood pressure increased, somnolence, tachycardia and vomiting. In addition, reports of accidental overdose with aripiprazole alone (up to 195 mg) in children have been received. The potentially medically serious signs and symptoms reported include somnolence, and transient loss of consciousness. In the patients who were evaluated in hospital settings, there were no reported observations indicating a clinically significant adverse change in vital signs, laboratory assessments, or ECG.

### ***Management of Overdosage***

No specific information is available on the treatment of overdose with aripiprazole. The possibility of multiple drug involvement should be considered. Therefore cardiovascular monitoring should commence immediately and should include continuous electrocardiographic monitoring to detect possible arrhythmias. Otherwise, management of overdose should concentrate on supportive therapy, maintaining an adequate airway, oxygenation and ventilation, and management of symptoms. Close medical supervision and monitoring should continue until the patient recovers.

**Charcoal:** In the event of an overdose of aripiprazole, an early charcoal administration may be useful in partially preventing the absorption of aripiprazole. In a single-dose study in which 15 mg of aripiprazole was administered to fully compliant, fully conscious, healthy, male volunteers and followed by activated charcoal (50 g), administered one hour after aripiprazole, aripiprazole AUC and  $C_{max}$  was decreased by 51 and 41%, respectively, compared to historic controls, suggesting that charcoal may be effective for overdose management.

**Haemodialysis:** Although there is no information on the effect of haemodialysis in treating an overdose with aripiprazole, haemodialysis is unlikely to be useful in overdose management, since aripiprazole is not eliminated unchanged by the kidneys and is highly bound to plasma proteins.

For information on the management of overdose, contact the Poisons Information Centre on 13 11 26 (Australia).

## 5 PHARMACOLOGICAL PROPERTIES

### 5.1 PHARMACODYNAMIC PROPERTIES

#### Mechanism of action

The mechanism of action of aripiprazole, as well as other drugs having efficacy in schizophrenia, is unknown. However, it has been proposed that the efficacy of aripiprazole is mediated through a combination of partial agonist activity at dopamine  $D_2$  and serotonin  $5HT_{1A}$  receptors and antagonist activity at serotonin  $5HT_{2A}$  receptors.

Aripiprazole activity is primarily due to the parent drug, aripiprazole.

Aripiprazole exhibited higher affinity binding *in vitro* for dopamine  $D_2$  and  $D_3$ , serotonin  $5HT_{1A}$  and  $5HT_{2A}$  receptors ( $K_i$  values of 0.3, 0.8, 1.7, and 3.4nM, respectively), than for dopamine  $D_4$ , serotonin  $5HT_{2C}$  and  $5HT_{7}$ ,  $\alpha_1$ -adrenergic and histamine  $H_1$  receptors ( $K_i$  values of 44, 15, 39, 57, and 61nM, respectively) and the serotonin reuptake site ( $K_i$  value of 98nM). Aripiprazole exhibited no appreciable affinity for muscarinic receptors ( $IC_{50} >1000nM$ ).

The predominant metabolite in human plasma, dehydro-aripiprazole has been shown to have a similar affinity for dopamine  $D_2$  and  $D_3$  receptors ( $K_i$  values 0.4 and 0.5nM, respectively) as the parent compound and a much lower affinity for the other receptor subtypes.

Aripiprazole exhibited antagonist properties in animal models of dopaminergic hyperactivity and agonist properties in animal models of dopaminergic hypoactivity.

Interaction with receptors other than dopamine and serotonin subtypes may explain some of the other clinical effects of aripiprazole.

## Clinical trials

### *Schizophrenia*

The efficacy of aripiprazole in the treatment of schizophrenia was evaluated in six short-term (4- and 6-week), placebo-controlled trials of inpatients, four of which also included an active control group consisting of either risperidone (one trial) or haloperidol (three trials). Studies were not powered to allow for a comparison of aripiprazole and the active comparators. Efficacy was also documented in two long-term trials, one of 52 weeks duration, which compared aripiprazole to haloperidol and one of 26 weeks duration, which compared aripiprazole to placebo. Patients in these trials met DSM-III/IV criteria for schizophrenia or schizo-affective disorder.

Several instruments were used for assessing psychiatric signs and symptoms. The Positive and Negative Syndrome Scale (PANSS) and Brief Psychiatric Rating Scale (BPRS) are both multi-item inventories of general psychopathology used to evaluate the effects of drug treatment in schizophrenia. The BPRS Psychosis Cluster (Core Score), a subset of the BPRS that can also be derived from the PANSS, is used to assess actively psychotic patients. The Clinical Global Impression (CGI) assessment reflects the impression of a skilled observer, fully familiar with the manifestations of schizophrenia, about the overall clinical state of the patient.

Four short-term, fixed-dose trials were well controlled and powered to statistically demonstrate the efficacy of aripiprazole over placebo. The results of these trials are described below:

**Trial 1)** In a 4-week, placebo-controlled trial (n=414) involving administration of 2 fixed doses of aripiprazole (15 or 30 mg/day) and haloperidol (10 mg/day) in acutely relapsed patients with a DSM-IV diagnosis of schizophrenia or schizo-affective disorder, aripiprazole 15 mg/day was superior to placebo with clinically meaningful changes in PANSS total, PANSS positive and negative subscales, CGI-severity, CGI-improvement, and PANSS-derived BPRS-core scores. The 30 mg dose was superior to placebo for all parameters except PANSS negative subscale.

**Trial 2)** In a 4-week, placebo controlled trial (n=404) involving administration of 2 fixed doses of aripiprazole (20 or 30 mg/day) and risperidone (6 mg/day) in acutely relapsed patients with a DSM-IV diagnosis of schizophrenia or schizo-affective disorder, both doses of aripiprazole were superior to placebo with clinically meaningful changes in the PANSS total, PANSS positive and negative subscales, CGI-severity, CGI-improvement and PANSS-derived BPRS-core scores.

**Trial 3)** In a 6-week, placebo-controlled trial (n=420) involving administration of 3 fixed doses of aripiprazole (10, 15, or 20 mg/day) in acutely relapsed patients with a DSM-IV diagnosis of schizophrenia, all aripiprazole dose groups were superior to placebo with clinically meaningful changes in the PANSS total score, the PANSS positive and negative subscales, the CGI severity and improvement scales, and the PANSS-derived BPRS core score.

**Trial 4)** In a 6-week trial (n=367) comparing three fixed doses of aripiprazole (2, 5 or 10 mg/day) to placebo, in acutely relapsed patients with a DSM-IV diagnosis of schizophrenia, the 10 mg dose of aripiprazole was superior to placebo in the PANSS total score, the primary outcome measure of the

study. In addition, the 10 mg dose was also superior to placebo in the PANSS positive subscale and the CGI severity score. Although the 5 mg dose of aripiprazole did not reach significance in the PANSS total score or the PANSS positive subscale, it was superior to placebo in the PANSS negative subscale and the CGI severity scale. The 2 mg<sup>1</sup> dose did not reach significance in any of these outcome measures.

Two initial placebo-controlled trials were conducted to explore the efficacy of aripiprazole. The first one (**Trial 5**) was a placebo-controlled, 4-week ascending dose trial of aripiprazole (5 to 30 mg/day) in 103 patients diagnosed with schizophrenia according to the DSM-III-R criteria with acute schizophrenic relapse and a history of response to antipsychotic drugs. In this trial, aripiprazole differentiated from placebo in the PANSS total score, the PANSS positive subscale, and the CGI severity scale. The second one (**Trial 6**) was a placebo-controlled, 4-week, fixed-dose trial of aripiprazole (2, 10, or 30 mg/day) in 272 patients diagnosed with schizophrenia according to the DSM-IV criteria with acute schizophrenic relapse and a history of response to antipsychotic drugs. Statistical significance was reached only for the 30 mg dose on the PANSS total score, the PANSS positive subscale, and the CGI severity and improvement scales.

Thus, the efficacy of 10 mg, 15 mg, 20 mg and 30 mg was established in two studies for each dose. Among these doses there was no evidence that the higher dose groups offered any advantage over the lowest dose group. Broad efficacy was established across a variety of endpoints with an onset of action as early as Week 1 for positive symptoms at doses of 15 mg and higher.

**Table 5** summarizes the results across all six trials.

**Table 5: Key Efficacy Results in Short-Term, Placebo-Controlled Trials**

	PANSS Total Score	PANSS Positive Subscale Score	PANSS Negative Subscale Score	PANSS- Derived BPRS Core Score	CGI- Severity Score	CGI Improvement Score
Trial/ Treatment	Mean Change	Mean Change	Mean Change	Mean Change	Mean Change	Mean Change
<b>Trial 1</b>						
Placebo	-2.9	-0.6	-1.2	-1.1	-0.1	4.3
Ari 15 mg	-15.5**	-4.2**	-3.6**	-3.1**	-0.6**	3.5**
Ari 30 mg	-11.4**	-3.8**	-2.3	-3.0**	-0.4**	3.8*
<b>Trial 2</b>						
Placebo	-5.0	-1.8	-0.8	-1.7	-0.2	4.0
Ari 20 mg	-14.5**	-4.9**	-3.4**	-3.5**	-0.5*	3.4**
Ari 30 mg	-13.9**	-3.9*	-3.4**	-3.3*	-0.6**	3.3**
<b>Trial 3</b>						
Placebo	-2.3	-1.1	0.1	-1.4	-0.2	4.0

<sup>1</sup> Aripiprazole 2 mg table is unavailable in this brand however is available in other brands.

Ari 10 mg	-15.0**	-5.0**	-3.5**	-3.9**	-0.7**	3.3**
Ari 15 mg	-11.7**	-3.8**	-2.6**	-2.9*	-0.5*	3.4**
Ari 20 mg	-14.4**	-4.5**	-3.3**	-3.6**	-0.6**	3.3**
<b>Trial 4</b>						
Placebo	-5.3	-2.3	-1.3	-2.3	-0.3	3.6
Ari 2 mg <sup>2</sup>	-8.2	-2.4	-2.0	-2.3	-0.3	3.6
Ari 5 mg	-10.6	-3.4	-2.9*	-3.2	-0.6*	3.2
Ari 10 mg	-11.3*	-4.2*	-2.7	-3.4	-0.6*	3.2
<b>Trial 5</b>						
Placebo	-1.5	-0.1	-0.9	-2.4	0.0	4.0
Ari 5-30 mg	-13.5**	-3.0*	-3.6	-8.6*	-0.6**	3.5*
<b>Trial 6</b>						
Placebo	-3.0	-0.97	-1.31	-1.48	-2.8	3.9
Ari 2 mg	-8.0	-1.96	-2.05	-1.95	-0.30	3.7
Ari 10 mg	-8.6	-2.10	-2.48	-1.79	-0.30	3.5
Ari 30 mg	-13.7**	-3.89*	-3.11	-2.97	-0.60*	3.1**

\*\* (P ≤ 0.01), \*(0.01 < P ≤ 0.05) significantly different from placebo.

NOTE: Results in boxes indicate the protocol-specified primary efficacy measures.

Ari = aripiprazole

A 52-week, haloperidol-controlled, long-term, maintenance trial (n=1294) was conducted in patients with acute relapse of chronic schizophrenia. In this trial involving the administration of aripiprazole 30 mg/day and haloperidol 10 mg/day, with a one-time option to decrease aripiprazole to 20 mg/day and haloperidol to 7 mg/day, aripiprazole was at least comparable to haloperidol in time-to-failure to maintain response in responders. Based on patients who responded at any time during the 52-week study (610/853, 72% in the aripiprazole group and 298/430, 69% in the haloperidol group), there was a 12% lower risk of subsequent failure with aripiprazole relative to haloperidol (relative risk: 0.881, 95% CI: 0.645 - 1.204). Aripiprazole was comparable to haloperidol in time-to-failure to maintain response in all randomized patients. Patients in the aripiprazole group had a 14% lower risk of failure compared with the haloperidol group (relative risk: 0.858, 95% CI: 0.721, 1.021). Aripiprazole was statistically superior to haloperidol in the analysis of the proportion of patients on treatment and in response at Weeks 8, 26, and 52 (pre-specified key time points). At Week 52, 40% of aripiprazole patients were still on-study and in response compared to 27% of haloperidol patients (p<0.001). Aripiprazole-treated patients had a statistically significant lower risk (31%) of discontinuations due to lack of efficacy or adverse event relative to haloperidol treated patients (relative risk 0.692; 95% CI: 0.573-0.837). There were no significant differences between aripiprazole and haloperidol groups in terms of change from baseline PANSS total scores, PANSS positive subscores, CGI- severity or improvement scores. Aripiprazole did result in a significantly greater improvement in the PANSS negative subscores at weeks 26 & 52 and the MADRS total score at Weeks 8, 26, and 52. [Mean change PANSS negative subscale score (week 26:

<sup>2</sup> Aripiprazole 2 mg is unavailable in this brand however is available in other brands.

p=0.029; 95% CI: -1.52, -0.08) (week 52: p=0.011; 95% CI: -1.73, -0.23). Mean change MADRS total score (week 8: p=0.027; 95% CI: -1.74, -0.11) (week 26: p=0.22; 95% CI:-1.95, -0.15) (week 52: p= 0.031; 95% CI: -1.97, -0.09).]

To further demonstrate the maintenance effects of aripiprazole, a double-blind study was conducted in chronic, symptomatically stable schizophrenic patients (n=310) randomised to aripiprazole 15 mg or placebo and followed for 26 weeks. Patients were observed for “impending psychotic relapse”, defined as CGI-improvement score  $\geq 5$  (minimally worse) or scores  $\geq 5$  (moderately severe) on the hostility or uncooperativeness items of the PANSS on two consecutive days or  $\geq 20\%$  increase in the PANSS Total Score. Patients in the placebo group experienced a higher relapse rate and/or relapsed sooner than those in the aripiprazole group. From 4 weeks onwards there were noticeably more relapses in the placebo group than the aripiprazole group. Kaplan Meier estimates showed that the estimated probability of not experiencing relapse prior to week 26 was 39% in the placebo group versus 63% in the aripiprazole group [relative risk aripiprazole: placebo = 0.50 (95% CI=0.35, 0.71,  $p \leq 0.01$ )]. The number of relapses was significantly lower in the aripiprazole group compared to placebo (34% vs 57%, RR=0.59, 95% CI: 0.45, 0.75,  $p \leq 0.01$ ).

No trials have been conducted in patients with first episode schizophrenia or treatment-resistant schizophrenia. Thus, efficacy in these groups of patients has not been established.

## 5.2 PHARMACOKINETIC PROPERTIES

### Absorption

#### *Oral Administration*

Aripiprazole is well absorbed after oral administration, with peak plasma concentrations occurring within 3-5 hours after dosing. The absolute oral bioavailability of the tablet formulation of aripiprazole is 87%.

Aripiprazole can be administered without regard to meals. Following administration of a 15 mg aripiprazole tablet with a standard high-fat meal, the  $C_{max}$  of aripiprazole and its active metabolite, dehydro-aripiprazole, increased by 11%. The AUC of aripiprazole was increased by 18% and that of the active metabolite by 14%.

Food delayed  $T_{max}$  by 3 hours for aripiprazole and 12 hours for the active metabolite. Aripiprazole accumulation is predictable from single dose pharmacokinetics. At steady state, the pharmacokinetics of aripiprazole are dose-proportional. There is no diurnal variation in the disposition of aripiprazole and its active metabolite, dehydro-aripiprazole.

### Distribution

Aripiprazole is widely distributed throughout the body with an apparent volume of distribution of 4.9 L/kg. At therapeutic concentrations, aripiprazole is highly bound (88–97% to >99%, as determined by polydimethylsiloxane-glass bead and equilibrium dialysis assays, respectively) to serum proteins, primarily albumin, *in vitro*. Aripiprazole did not alter the pharmacokinetics and pharmacodynamics of highly protein-bound warfarin, suggesting that protein displacement of warfarin did not occur.

### Metabolism

Aripiprazole undergoes minimal pre-systemic metabolism. Aripiprazole is extensively metabolized by the

liver primarily by three biotransformation pathways: dehydrogenation, hydroxylation, and N-dealkylation. Based on *in vitro* studies, CYP3A4 and CYP2D6 enzymes are primarily responsible for dehydrogenation and hydroxylation of aripiprazole, while N-dealkylation is primarily catalyzed by CYP3A4. Aripiprazole is the predominant drug moiety in systemic circulation. At steady state, dehydro-aripiprazole, the active metabolite, represented about 39% of aripiprazole AUC in plasma. Approximately 8% of Caucasians lack the capacity to metabolize CYP2D6 substrates and are classified as poor metabolizers (PM), whereas the rest are extensive metabolizers (EM). PMs have about an 80% increase in aripiprazole exposure and about a 30% decrease in exposure to the active metabolite compared to EMs, resulting in about a 60% higher exposure to the total active moieties from a given dose of aripiprazole compared to EMs. Subjects were entered into clinical studies without knowledge of their metabolizer status and, therefore, the safety profile reflects experience in both EMs and PMs.

### **Excretion**

Following a single, oral dose of [<sup>14</sup>C]-labeled aripiprazole, approximately 27% and 60% of the administered radioactivity was recovered in the urine and faeces, respectively. Less than 1% of unchanged aripiprazole was excreted in the urine and approximately 18% of the oral dose was recovered unchanged in the faeces. The total body clearance of aripiprazole is 0.7 mL/min/kg, which is primarily hepatic.

In a bioavailability study comparing fasted and fed subjects at a dose of 15 mg, the elimination half-life of aripiprazole from human plasma was found to be 75 hours mean, range 32–146 hours, n=58, in fasted subjects and 84 hours mean, range 32-157 hours, n=57 in subjects taking a high-fat meal immediately before drug administration. Steady-state concentrations are attained within 14 days of dosing. The plasma elimination half-life of the chief metabolite, dehydro- aripiprazole, from human plasma was found to be approx. 100 hours.

### **Elderly**

There were no differences in the pharmacokinetics of aripiprazole between healthy elderly and younger adult subjects nor was there any detectable effect of age in a population pharmacokinetic analysis in schizophrenic patients. In formal single-dose pharmacokinetic studies (with aripiprazole given in a single dose of 15 mg), aripiprazole clearance was 20% lower in elderly (≥65 years) subjects compared to younger adult subjects (18-64 years). There was no detectable age effect, however, in the population pharmacokinetic analysis in schizophrenia patients. Also, the pharmacokinetics of aripiprazole after multiple doses in elderly patients appeared similar to that observed in young healthy subjects. No dosage adjustment is recommended for elderly patients. (See Section 4.4, **SPECIAL WARNINGS AND PRECAUTIONS FOR USE: Increased Mortality in Elderly Patients with Dementia- Related Psychosis and Use in the Elderly**)

### **Gender**

There were no differences in the pharmacokinetics of aripiprazole between healthy male and female subjects nor was there any detectable effect of gender in a population pharmacokinetic analysis in schizophrenic patients.  $C_{max}$  and AUC of aripiprazole and its active metabolite, dehydro-aripiprazole, are 30 to 40% higher in women than in men, and correspondingly, the apparent oral clearance of aripiprazole is lower in women. These differences, however, are largely explained by differences in

body weight (25%) between men and women. No dosage adjustment is recommended based on gender.

### **Race**

Population pharmacokinetic evaluation has revealed no evidence of clinically significant race-related differences in the pharmacokinetics of aripiprazole.

### **Smoking**

Population pharmacokinetic evaluation has revealed no evidence of clinically significant effects of smoking on the pharmacokinetics of aripiprazole. Based on studies utilizing human liver enzymes *in vitro*, aripiprazole is not a substrate for CYP1A2 and also does not undergo direct glucuronidation. Smoking should, therefore, not have an effect on the pharmacokinetics of aripiprazole. Consistent with these *in vitro* results, population pharmacokinetic evaluation did not reveal any significant pharmacokinetic differences between smokers and non-smokers. No dosage adjustment is recommended based on smoking status.

### **Renal Impairment**

The pharmacokinetic characteristics of aripiprazole and dehydro-aripiprazole were found to be similar in patients with severe renal disease compared to young healthy subjects. In patients with severe renal impairment (creatinine clearance <30 mL/min),  $C_{max}$  of aripiprazole (given in a single dose of 15 mg) and dehydro-aripiprazole increased by 36% and 53%, respectively, but AUC was 15% lower for aripiprazole and 7% higher for dehydro-aripiprazole. Renal excretion of both unchanged aripiprazole and dehydro-aripiprazole is less than 1% of the dose. No dosage adjustment is required in subjects with renal impairment.

### **Hepatic Impairment**

A study in subjects with varying degrees of liver cirrhosis (Child-Pugh Classes A, B, and C) did not reveal a significant effect of hepatic impairment on the pharmacokinetics of aripiprazole and dehydro-aripiprazole. In a single-dose study (15 mg of aripiprazole) in subjects with varying degrees of liver cirrhosis (Child-Pugh Classes A, B, and C), the AUC of aripiprazole, compared to healthy subjects, increased 31% in mild HI, increased 8% in moderate HI, and decreased 20% in severe HI. None of these differences would require dose adjustment.

## **5.3 PRECLINICAL SAFETY DATA**

Choleliths (gallsand and/or gallstones) were observed in the bile of monkeys given aripiprazole orally for 4 – 52 weeks at doses of 25 –125 mg/kg/day (1 – 3 times the MRHD based on plasma AUC and 15 –76 times the MRHD based on mg/m<sup>2</sup>) and were attributed to precipitation of sulfate conjugates of hydroxy metabolites, which exceeded their solubility limits in bile. Human biliary concentrations of these sulfate conjugates after repeated daily administration of the MRHD are substantially lower (0.2 – 14% of their *in vitro* solubility limits).

Bilateral retinal degeneration was observed in albino rats given oral aripiprazole for 6 months or two years at exposures of 6-13 times the clinical exposure at the MRHD (based on plasma AUC). The

exposure at the NOEL dose was 3 times that at the MRHD. A subsequent 18-month study reported this finding in albino but not pigmented rats, possibly due to lack of photoprotective ocular melanin in the albino rats, although it is unknown whether pigmentation prevented or merely delayed retinal degeneration in the pigmented rats.. The clinical relevance of this finding is uncertain.

### **Genotoxicity**

Aripiprazole was tested in a standard range of assays for gene mutation, chromosomal damage, and DNA damage and repair. Aripiprazole was non-genotoxic in the *in vitro* bacterial reverse-mutation assay, the *in vitro* forward gene mutation assay in mouse lymphoma cells, *in vitro* bacterial DNA repair assay, and the unscheduled DNA synthesis assay in rat hepatocytes. However, aripiprazole and its minor metabolite 2,3-DCPP were clastogenic in the *in vitro* chromosomal aberration assay in Chinese hamster lung (CHL) cells in both the presence and absence of metabolic activation. A positive response for aripiprazole in 1 of 6 *in vivo* mouse micronucleus tests was attributed to drug-induced hypothermia.

### **Carcinogenicity**

Lifetime carcinogenicity studies were conducted in ICR mice and in Sprague - Dawley (SD) and Fischer (F344) rats. Aripiprazole was administered for 2 years in the diet at doses of 1, 3, 10, and 30 mg/kg/day to ICR mice and 1, 3, and 10 mg/kg/day to F344 rats (0.2 to 5 and 0.3 to 3 times the maximum recommended human dose [MRHD] based on mg/m<sup>2</sup>, respectively). SD rats were dosed orally by gavage for 2 years at 10, 20, 40, and 60 mg/kg/day (3 to 18 times the MRHD based on mg/m<sup>2</sup>). There was no evidence of tumorigenesis in male mice or rats. In female mice, the incidences of pituitary gland adenomas and mammary gland adenocarcinomas and adenoacanthomas were increased at dietary doses of 3 to 30 mg/kg/day (0.1 to 0.9 times MRHD based on AUC and 0.5 to 5 times the MRHD based on mg/m<sup>2</sup>). In female rats, the incidence of mammary gland fibroadenomas was increased at a dietary dose of 10 mg/kg/day (<0.1 times MRHD based on AUC and 3 times the MRHD based on mg/m<sup>2</sup>); and the incidences of adrenocortical carcinomas and combined adrenocortical adenomas/carcinomas were increased at an oral gavage dose of 60 mg/kg/day (10 times the MRHD based on AUC and 18 times MRHD based on mg/m<sup>2</sup>). In male rats, the incidence of benign and combined benign/malignant pheochromocytomas were also increased at an oral gavage dose of 60 mg/kg/day (10 times the MRHD based on AUC and 18 times the MRHD based on mg/m<sup>2</sup>).

Proliferative changes in the pituitary and mammary gland of rodents have been observed following chronic administration of other antipsychotic agents and are considered prolactin- mediated. Serum prolactin was not measured in the aripiprazole carcinogenicity studies. Hyperprolactinaemia was observed in female mice in a 13-week dietary study at doses associated with mammary gland and pituitary tumours, but not in female rats in 4- and 13-week dietary studies at doses associated with mammary gland tumours. Hyperprolactinaemia was observed in female rats after 5 and 13 weeks of oral administration at doses up to that associated with adrenocortical tumours, but serum prolactin was decreased at this dose in male rats. The relationship between tumourigenic findings with aripiprazole and prolactin is unclear and the relevance for human risk of prolactin-mediated endocrine tumours is unknown. The adrenocortical response in female rats is considered a consequence of increased adrenocortical cell proliferation secondary to chronic drug-related adrenocortical cytotoxicity; the no-effect exposure (plasma AUC) was about fold 7 clinical exposure at the MRHD.

## 6 PHARMACEUTICAL PARTICULARS

### 6.1 LIST OF EXCIPIENTS

The inactive ingredients in the tablets are: lactose monohydrate, maize starch, microcrystalline cellulose, hypolose, magnesium stearate and croscarmellose sodium. The following colorants are also contained in the tablets: 5 mg tablets – iron oxide yellow; 10 mg tablets - iron oxide red; 15 mg tablets – iron oxide yellow; 20 mg tablets – nil; 30 mg tablets – iron oxide red.

### 6.2 INCOMPATIBILITIES

Incompatibilities were either not assessed or not identified as part of the registration of this medicine.

### 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.

### 6.5 NATURE AND CONTENTS OF CONTAINER

Tevariprazole tablets are available in OPA/Al/PVC-Al blister in cartons in a pack size of 30 tablets.

### 6.6 SPECIAL PRECAUTIONS FOR DISPOSAL

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

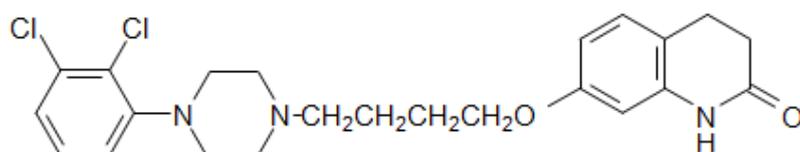
### 6.7 PHYSICOCHEMICAL PROPERTIES

Aripiprazole is a novel antipsychotic agent with unique pharmacologic properties and a chemical structure that differs from current antipsychotic agents.

Since aripiprazole is insoluble in water with its equilibrium solubility being about 0.00001% w/v, its  $pK_a$  was established in 20% aqueous ethanol  $pK_a = 7.6$  (20% ethanol, at 25°C). The partition coefficients ( $P_{O/W}$ ) of aripiprazole range from 3.4 at pH 2.0 to > 1000 at pH 6.0.

### Chemical structure

The structural formula of aripiprazole is shown below:



Active ingredient: Aripiprazole  
Chemical name: 7-[4-[4-(2, 3-dichlorophenyl)-1-piperazinyl] butoxy]-3, 4- dihydrocarbostyryl  
Molecular formula:  $C_{23}H_{27}Cl_2N_3O_2$   
Molecular weight: 448.39

### CAS number

129722-12-9

## 7 MEDICINE SCHEDULE (POISONS STANDARD)

Prescription Only Medicine (Schedule 4)

## 8 SPONSOR

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[www.tevapharma.com.au](http://www.tevapharma.com.au)

## 9 DATE OF FIRST APPROVAL

10 March 2016. (5mg tablet: AUST R 238013; 10mg tablet: AUST R 238014; 15mg tablet: AUST R 238032; 20mg tablet: AUST R 238033; 30mg tablet: AUST R 238034)

## 10 DATE OF REVISION

11 May 2020

### SUMMARY TABLE OF CHANGES

Section Changed	Summary of new information
6.1	Ingredient name harmonisation