

Summary of Product Characteristics

1 NAME OF THE MEDICINAL PRODUCT

Zispin 15 mg/ml oral solution

2 QUALITATIVE AND QUANTITATIVE COMPOSITION

1 ml of Zispin oral solution contains 15 mg of mirtazapine.

Excipient(s) with known effect

1 ml of Zispin oral solution contains 700 mg maltitol liquid.

Zispin oral solution contains 0.3 % v/v ethanol.

For the full list of excipients, see section 6.1.

3 PHARMACEUTICAL FORM

Oral solution.

Clear, colourless-to-straw aqueous solution with a characteristic citrus-orange odour.

4 CLINICAL PARTICULARS

4.1 Therapeutic Indications

Zispin is indicated in adults for the treatment of episodes of major depression.

4.2 Posology and method of administration

Posology

Adults

The effective daily dose is usually between 15 and 45 mg; the starting dose is 15 or 30 mg.

Mirtazapine begins to exert its effect in general after 1–2 weeks of treatment. Treatment with an adequate dose should result in a positive response within 2–4 weeks. With an insufficient response, the dose can be increased up to the maximum dose. If there is no response within a further 2–4 weeks, then treatment should be stopped.

Patients with depression should be treated for a sufficient period of at least 6 months to ensure that they are free from symptoms.

It is recommended to discontinue treatment with mirtazapine gradually to avoid withdrawal symptoms (see section 4.4).

Elderly

The recommended dose is the same as that for adults. In elderly patients an increase in dosing should be done under close supervision to elicit a satisfactory and safe response.

Renal impairment

The clearance of mirtazapine may be decreased in patients with moderate to severe renal impairment (creatinine clearance <40 ml/min). This should be taken into account when prescribing Zispin to this category of patients (see section 4.4).

Hepatic impairment

The clearance of mirtazapine may be decreased in patients with hepatic impairment. This should be taken into account when prescribing Zispin to this category of patients, particularly with severe hepatic impairment, as patients with severe hepatic impairment have not been investigated (see section 4.4).

Paediatric population

Zispin should not be used in children and adolescents under the age of 18 years as efficacy was not demonstrated in two short-term clinical trials (see section 5.1) and because of safety concerns (see sections 4.4, 4.8 and 5.1).

Method of administration

Mirtazapine has an elimination half-life of 20–40 hours and therefore Zispin is suitable for once daily administration. It should be taken preferably as a single night-time dose before going to bed. Zispin may also be given in two divided doses (once in the morning and once at night-time, the higher dose should be taken at night). The solution should be taken orally, in a glass containing some water.

Preparation of the bottle

Removing the screw cap from the bottle

The cap should be pressed downwards while at the same time rotating it anti-clockwise. The seal attached to the cap will break first; further pressing and turning will unscrew the cap. This procedure is given in symbolic instructions on the top of the screw cap.

Applying the metering pump to the bottle

After taking the pump out of the plastic bag it should be fitted onto the bottle by carefully inserting the plastic tube into the bottle opening. The pump should be pressed onto the top of the bottle and screwed until it locks tightly on the bottle. After a click, there should be one final tightening to ensure that the pump is securely screwed in place.

Using the metering pump to dispense the oral solution

The nozzle has two positions and can be turned gently – anti-clockwise (unlocked position) and clockwise (locked position). In the locked position, the nozzle cannot be pressed down and no oral solution can be discharged. The unlocked position is the normal position for discharging the oral solution. The nozzle should be turned gently anti-clockwise until it cannot be turned any further (about one-quarter turn); the pump is then ready for use.

Dosing the oral solution

Preparing the metering pump for dosing

When the pump is pressed for the first time it will not discharge the correct quantity of oral solution. Therefore, the pump must be prepared (primed) by fully pressing down the nozzle 3 times; the oral solution which comes out of the nozzle should be disposed of. Thereafter, each pump will give the correct dose (1 ml containing 15 mg of the active substance mirtazapine).

Using the metering pump for normal dosing

The bottle should be placed on a flat level surface, such as a table top. The nozzle should be pressed in a firm, smooth, continuous action (not too slowly) all the way down until it stops, holding a glass containing some water under the opening of the nozzle. The nozzle can then be released and the pump is ready for the following dose.

4.3 Contraindications

Hypersensitivity to the active substance or to any of the excipients listed in section 6.1.

Concomitant use of mirtazapine with monoamine oxidase (MAO) inhibitors (see section 4.5).

4.4 Special warnings and precautions for use

Paediatric population

Zispin should not be used in the treatment of children and adolescents under the age of 18 years. Suicide-related behaviours (suicide attempt and suicidal thoughts), and hostility (predominantly aggression, oppositional behaviour and anger) were more frequently observed in clinical trials among children and adolescents treated with antidepressants compared to those treated with placebo. If, based on clinical need, a decision to treat is nevertheless taken, the patient should be carefully monitored for the appearance of suicidal symptoms. In addition, long-term safety data in children and adolescents concerning growth, maturation and cognitive and behavioural development are lacking.

Suicide/suicidal thoughts or clinical worsening

Depression is associated with an increased risk of suicidal thoughts, self harm and suicide (suicide-related events). This risk persists until significant remission occurs. As improvement may not occur during the first few weeks or more of treatment, patients should be closely monitored until such improvement occurs. It is general clinical experience that the risk of suicide may increase in the early stages of recovery.

Patients with a history of suicide-related events or those exhibiting a significant degree of suicidal ideation prior to commencement of treatment are known to be at greater risk of suicidal thoughts or suicide attempts, and should receive careful monitoring during treatment. A meta-analysis of placebo-controlled clinical trials of antidepressants in adult patients with psychiatric disorders showed an increased risk of suicidal behaviour with antidepressants compared to placebo in patients less than 25 years old.

Close supervision of patients and in particular those at high risk should accompany therapy with antidepressants especially in early treatment and following dose changes. Patients (and caregivers of patients) should be alerted about the need to monitor for any clinical worsening, suicidal behaviour or thoughts and unusual changes in behaviour and to seek medical advice immediately if these symptoms present.

With regard to the chance of suicide, in particular at the beginning of treatment, only the smallest quantity of Zispin oral solution should be given to the patient consistent with good patient management, in order to reduce the risk of overdose.

Bone marrow depression

Bone marrow depression, usually presenting as granulocytopenia or agranulocytosis, has been reported during treatment with Zispin. Reversible agranulocytosis has been reported as a rare occurrence in clinical studies with Zispin. In the postmarketing period with Zispin very rare cases of agranulocytosis have been reported, mostly reversible, but in some cases fatal. Fatal cases mostly concerned patients with an age above 65. The physician should be alert for symptoms like fever, sore throat, stomatitis or other signs of infection; when such symptoms occur, treatment should be stopped and blood counts taken.

Jaundice

Treatment should be discontinued if jaundice occurs.

Conditions which need supervision

Careful dosing as well as regular and close monitoring is necessary in patients with:

- epilepsy and organic brain syndrome: Although clinical experience indicates that epileptic seizures are rare during mirtazapine treatment, as with other antidepressants, Zispin should be introduced cautiously in patients who have a history of seizures. Treatment should be discontinued in any patient who develops seizures, or where there is an increase in seizure frequency.
- hepatic impairment: Following a single 15 mg oral dose of mirtazapine, the clearance of mirtazapine was approximately 35 % decreased in mild to moderate hepatically impaired patients, compared to subjects with normal hepatic function. The average plasma concentration of mirtazapine was about 55 % increased.
- renal impairment: Following a single 15 mg oral dose of mirtazapine, in patients with moderate (creatinine clearance <40 ml/min) and severe (creatinine clearance \leq 10 ml/min) renal impairment the clearance of mirtazapine was about 30 % and 50 % decreased respectively, compared to normal subjects. The average plasma concentration of mirtazapine was about 55 % and 115 % increased respectively. No significant differences were found in patients with mild renal impairment (creatinine clearance <80 ml/min) as compared to the control group.
- cardiac diseases like conduction disturbances, angina pectoris and recent myocardial infarction, where normal precautions should be taken and concomitant medicines carefully administered.
- low blood pressure.

- diabetes mellitus: In patients with diabetes, antidepressants may alter glycaemic control. Insulin and/or oral hypoglycaemic dosage may need to be adjusted and close monitoring is recommended.

Like with other antidepressants, the following should be taken into account:

- Worsening of psychotic symptoms can occur when antidepressants are administered to patients with schizophrenia or other psychotic disturbances; paranoid thoughts can be intensified
- When the depressive phase of bipolar disorder is being treated, it can transform into the manic phase. Patients with a history of mania/hypomania should be closely monitored. Mirtazapine should be discontinued in any patient entering a manic phase.
- Although Zispin is not addictive, post-marketing experience shows that abrupt termination of treatment after long term administration may sometimes result in withdrawal symptoms. The majority of withdrawal reactions are mild and self-limiting. Among the various reported withdrawal symptoms, dizziness, agitation, anxiety, headache and nausea are the most frequently reported. Even though they have been reported as withdrawal symptoms, it should be realized that these symptoms may be related to the underlying disease. As advised in section 4.2, it is recommended to discontinue treatment with mirtazapine gradually.
- Care should be taken in patients with micturition disturbances like prostate hypertrophy and in patients with acute narrow-angle glaucoma and increased intra-ocular pressure (although there is little chance of problems with Zispin because of its very weak anticholinergic activity).
- Akathisia/psychomotor restlessness: The use of antidepressants have been associated with the development of akathisia, characterized by a subjectively unpleasant or distressing restlessness and need to move often accompanied by an inability to sit or stand still. This is most likely to occur within the first few weeks of treatment. In patients who develop these symptoms, increasing the dose may be detrimental.
- Cases of QT prolongation, Torsades de Pointes, ventricular tachycardia, and sudden death, have been reported during the post-marketing use of mirtazapine. The majority of reports occurred in association with overdose or in patients with other risk factors for QT prolongation, including concomitant use of QTc prolonging medicines (see section 4.5 and section 4.9). Caution should be exercised when Zispin is prescribed in patients with known cardiovascular disease or family history of QT prolongation, and in concomitant use with other medicinal products thought to prolong the QTc interval.

Hyponatraemia

Hyponatraemia, probably due to inappropriate antidiuretic hormone secretion (SIADH), has been reported very rarely with the use of mirtazapine. Caution should be exercised in patients at risk, such as elderly patients or patients concomitantly treated with medications known to cause hyponatraemia.

Serotonin syndrome

Interaction with serotonergic active substances: serotonin syndrome may occur when selective serotonin reuptake inhibitors (SSRIs) are used concomitantly with other serotonergic active substances (see section 4.5). Symptoms of serotonin syndrome may be hyperthermia, rigidity, myoclonus, autonomic instability with possible rapid fluctuations of vital signs, mental status changes that include confusion, irritability and extreme agitation progressing to delirium and coma. Caution should be advised and a closer clinical monitoring is required when these active substances are combined with mirtazapine. Treatment with mirtazapine should be discontinued if such events occur and supportive symptomatic treatment initiated. From post marketing experience it appears that serotonin syndrome occurs very rarely in patients treated with Zispin alone (see section 4.8).

Elderly

Elderly are often more sensitive, especially with regard to the undesirable effects of antidepressants. During clinical research with Zispin, undesirable effects have not been reported more often in elderly patients than in other age groups.

Maltitol liquid

This medicinal product contains maltitol liquid. Patients with rare hereditary problems of fructose intolerance should not take this medicine.

Ethanol

This medicinal product contains small amounts of ethanol, less than 100 mg per daily dose.

Switching from tablets to oral solution

There are slight pharmacokinetic differences between oral solution and tablets; although these differences are likely to be of no clinical relevance, care should be taken when switching from tablets to oral solution.

4.5 Interaction with other medicinal products and other forms of interaction

Pharmacodynamic interactions

- Mirtazapine should not be administered concomitantly with MAO inhibitors or within two weeks after discontinuation of MAO inhibitor therapy. In the opposite way about two weeks should pass before patients treated with mirtazapine should be treated with MAO inhibitors (see section 4.3).
In addition, as with SSRIs, co-administration with other serotonergic active substances (L-tryptophan, triptans, tramadol, linezolid, methylene blue, SSRIs, venlafaxine, lithium and St. John's Wort – *Hypericum perforatum* – preparations) may lead to an incidence of serotonin associated effects (serotonin syndrome: see section 4.4). Caution should be advised and a closer clinical monitoring is required when these active substances are combined with mirtazapine.
- Mirtazapine may increase the sedating properties of benzodiazepines and other sedatives (notably most antipsychotics, antihistamine H1 antagonists, opioids). Caution should be exercised when these medicinal products are prescribed together with mirtazapine.
- Mirtazapine may increase the CNS depressant effect of alcohol. Patients should therefore be advised to avoid alcoholic beverages while taking mirtazapine.
- Mirtazapine dosed at 30 mg once daily caused a small but statistically significant increase in the international normalized ratio (INR) in subjects treated with warfarin. As at a higher dose of mirtazapine a more pronounced effect cannot be excluded, it is advisable to monitor the INR in case of concomitant treatment of warfarin with mirtazapine.
- The risk of QT prolongation and/or ventricular arrhythmias (e.g. Torsades de Pointes) may be increased with concomitant use of medicines which prolong the QTc interval (e.g. some antipsychotics and antibiotics).

Pharmacokinetic interactions

- Carbamazepine and phenytoin, CYP3A4 inducers, increased mirtazapine clearance about twofold, resulting in a decrease in average plasma mirtazapine concentration of 60 % and 45 %, respectively. When carbamazepine or any other inducer of hepatic metabolism (such as rifampicin) is added to mirtazapine therapy, the mirtazapine dose may have to be increased. If treatment with such medicinal product is discontinued, it may be necessary to reduce the mirtazapine dose.
- Co-administration of the potent CYP3A4 inhibitor ketoconazole increased the peak plasma levels and the AUC of mirtazapine by approximately 40% and 50% respectively.
- When cimetidine (weak inhibitor of CYP1A2, CYP2D6 and CYP3A4) is administered with mirtazapine, the mean plasma concentration of mirtazapine may increase more than 50 %. Caution should be exercised and the dose may have to be decreased when co-administering mirtazapine with potent CYP3A4 inhibitors, HIV protease inhibitors,azole antifungals, erythromycin, cimetidine or nefazodone.
- Interaction studies did not indicate any relevant pharmacokinetic effects on concurrent treatment of mirtazapine with paroxetine, amitriptyline, risperidone or lithium.

Paediatric population

Interaction studies have only been performed in adults.

4.6 Fertility, pregnancy and lactation

Pregnancy

Limited data of the use of mirtazapine in pregnant women do not indicate an increased risk for congenital malformations. Studies in animals have not shown any teratogenic effects of clinical relevance, however developmental toxicity has been observed (see section 5.3).

Epidemiological data have suggested that the use of SSRIs in pregnancy, particularly in late pregnancy, may increase the risk of persistent pulmonary hypertension in the newborn (PPHN). Although no studies have investigated the association of PPHN to mirtazapine treatment, this potential risk cannot be ruled out taking into account the related mechanism of action (increase in serotonin concentrations).

Caution should be exercised when prescribing to pregnant women. If Zispin is used until, or shortly before birth,

postnatal monitoring of the newborn is recommended to account for possible discontinuation effects.

Breast-feeding

Animal studies and limited human data have shown excretion of mirtazapine in breast milk only in very small amounts. A decision on whether to continue/discontinue breast-feeding or to continue/discontinue therapy with Zispin should be made taking into account the benefit of breast-feeding to the child and the benefit of Zispin therapy to the woman.

Fertility

Non-clinical reproductive toxicity studies in animals did not show any effect on fertility.

4.7 Effects on ability to drive and use machines

Zispin has minor to moderate influence on the ability to drive and use machines. Zispin may impair concentration and alertness (particularly in the initial phase of treatment). Patients should avoid the performance of potentially dangerous tasks, which require alertness and good concentration, such as driving a motor vehicle or operating machinery, at any time when affected.

4.8 Undesirable effects

Depressed patients display a number of symptoms that are associated with the illness itself. It is therefore sometimes difficult to ascertain which symptoms are a result of the illness itself and which are a result of treatment with Zispin. The most commonly reported adverse reactions, occurring in more than 5 % of patients treated with Zispin in randomized placebo-controlled trials (see below) are somnolence, sedation, dry mouth, weight increased, increase in appetite, dizziness and fatigue.

All randomized placebo-controlled trials in patients (including indications other than major depressive disorder), have been evaluated for adverse reactions of Zispin. The meta-analysis considered 20 trials, with a planned duration of treatment up to 12 weeks, with 1,501 patients (134 person years) receiving doses of mirtazapine up to 60 mg and 850 patients (79 person years) receiving placebo. Extension phases of these trials have been excluded to maintain comparability to placebo treatment.

Table 1 shows the categorized incidence of the adverse reactions, which occurred in the clinical trials statistically significantly more frequently during treatment with Zispin than with placebo, added with adverse reactions from spontaneous reporting. The frequencies of the adverse reactions from spontaneous reporting are based on the reporting rate of these events in the clinical trials. The frequency of adverse reactions from spontaneous reporting for which no cases in the randomized placebo-controlled patient trials were observed with mirtazapine has been classified as 'not known'.

Table 1. Adverse reactions of Zispin

System organ class	Very common (≥1/10)	Common (≥1/100 to <1/10)	Uncommon (≥1/1,000 to <1/100)	Rare (≥1/10,000 to <1/1,000)	Frequency not known (cannot be estimated from the available data)
<i>Blood and the lymphatic system disorders</i>					<ul style="list-style-type: none"> ▪ Bone marrow depression (granulocytopenia, agranulocytosis, aplastic anaemia, thrombocytopenia) ▪ Eosinophilia
<i>Endocrine disorders</i>					<ul style="list-style-type: none"> ▪ Inappropriate antidiuretic hormone secretion
<i>Metabolism and nutrition disorders</i>	<ul style="list-style-type: none"> ▪ Weight increased¹ ▪ Increase in 				<ul style="list-style-type: none"> ▪ Hyponatraemia

	appetite ¹				
Psychiatric disorders		<ul style="list-style-type: none"> ▪ Abnormal dreams ▪ Confusion ▪ Anxiety^{2, 5} ▪ Insomnia^{3, 5} 	<ul style="list-style-type: none"> ▪ Nightmares² ▪ Mania ▪ Agitation² ▪ Hallucinations ▪ Psychomotor restlessness (incl. akathisia, hyperkinesia) 	<ul style="list-style-type: none"> ▪ Aggression 	<ul style="list-style-type: none"> ▪ Suicidal ideation⁶ ▪ Suicidal behaviour⁶
Nervous system disorders	<ul style="list-style-type: none"> ▪ Somnolence^{1, 4} ▪ Sedation^{1, 4} ▪ Headache² 	<ul style="list-style-type: none"> ▪ Lethargy¹ ▪ Dizziness ▪ Tremor 	<ul style="list-style-type: none"> ▪ Paraesthesia² ▪ Restless legs ▪ Syncope 	<ul style="list-style-type: none"> ▪ Myoclonus 	<ul style="list-style-type: none"> ▪ Convulsions (insects) ▪ Serotonin syndrome ▪ Oral paresthesia ▪ Dysarthria
Vascular disorders		<ul style="list-style-type: none"> ▪ Orthostatic hypotension 	<ul style="list-style-type: none"> ▪ Hypotension² 		
Gastrointestinal disorders	<ul style="list-style-type: none"> ▪ Dry mouth 	<ul style="list-style-type: none"> ▪ Nausea³ ▪ Diarrhea² ▪ Vomiting² ▪ Constipation¹ 	<ul style="list-style-type: none"> ▪ Oral hypo-aesthesia 	<ul style="list-style-type: none"> ▪ Pancreatitis 	<ul style="list-style-type: none"> ▪ Mouth oedema ▪ Increased salivation
Hepatobiliary disorders				<ul style="list-style-type: none"> ▪ Elevations in serum transaminase activities 	
Skin and subcutaneous tissue disorders		<ul style="list-style-type: none"> ▪ Exanthema² 			<ul style="list-style-type: none"> ▪ Stevens-Johnson Syndrome ▪ Dermatitis bullous ▪ Erythema multiforme ▪ Toxic epidermal necrolysis
Musculoskeletal and connective tissue disorders		<ul style="list-style-type: none"> ▪ Arthralgia ▪ Myalgia ▪ Back pain¹ 			<ul style="list-style-type: none"> ▪ Rhabdomyolysis
Renal and urinary disorders					<ul style="list-style-type: none"> ▪ Urinary retention
General disorders and administration site conditions		<ul style="list-style-type: none"> ▪ Oedema peripheral¹ ▪ Fatigue 			<ul style="list-style-type: none"> ▪ Somnambulism ▪ Generalised oedema ▪ Localised oedema
Investigations					<ul style="list-style-type: none"> ▪ Increased creatine kinase

1 In clinical trials these events occurred statistically significantly more frequently during treatment with Zispin than with placebo.

2 In clinical trials these events occurred more frequently during treatment with placebo than with Zispin, however not statistically significantly more frequently.

3 In clinical trials these events occurred statistically significantly more frequently during treatment with placebo than with Zispin.

4 N.B. dose reduction generally does not lead to less somnolence/sedation but can jeopardize antidepressant efficacy.

5 Upon treatment with antidepressants in general, anxiety and insomnia (which may be symptoms of depression) can

develop or become aggravated.

Under mirtazapine treatment, development or aggravation of anxiety and insomnia has been reported.

6 Cases of suicidal ideation and suicidal behaviours have been reported during mirtazapine therapy or early after treatment discontinuation (see section 4.4).

In laboratory evaluations in clinical trials transient increases in transaminases and gamma-glutamyltransferase have been observed (however associated adverse events have not been reported statistically significantly more frequently with Zispin than with placebo).

Paediatric population

The following adverse events were observed commonly in clinical trials in children: weight gain, urticaria and hypertriglyceridaemia (see also section 5.1).

Reporting of suspected adverse reactions

Reporting suspected adverse reactions after authorisation of the medicinal product is important. It allows continued monitoring of the benefit/risk balance of the medicinal product. Healthcare professionals are asked to report any suspected adverse reactions via HPRA Pharmacovigilance, Earlsfort Terrace, IRL - Dublin 2; Tel: +353 1 6764971; Fax: +353 1 6762517; Website: <http://www.hpra.ie/>; E-mail: medsafety@hpra.ie

4.9 Overdose

Present experience concerning overdose with Zispin alone indicates that symptoms are usually mild. Depression of the central nervous system with disorientation and prolonged sedation have been reported, together with tachycardia and mild hyper- or hypotension. However, there is a possibility of more serious outcomes (including fatalities) at dosages much higher than the therapeutic dose, especially with mixed overdoses. In these cases QT prolongation and Torsade de Pointes have also been reported.

Cases of overdose should receive appropriate symptomatic and supportive therapy for vital functions. ECG monitoring should be undertaken. Activated charcoal or gastric lavage should also be considered.

Paediatric population

The appropriate actions as described for adults should be taken in case of an overdose in paediatrics.

5 PHARMACOLOGICAL PROPERTIES

5.1 Pharmacodynamic properties

Pharmacotherapeutic group: other antidepressants, ATC code: N06AX11

Mechanism of action/pharmacodynamic effects

Mirtazapine is a centrally active presynaptic α_2 -antagonist, which increases central noradrenergic and serotonergic neurotransmission. The enhancement of serotonergic neurotransmission is specifically mediated via 5-HT₁ receptors, because 5-HT₂ and 5-HT₃ receptors are blocked by mirtazapine. Both enantiomers of mirtazapine are presumed to contribute to the antidepressant activity, the S(+) enantiomer by blocking α_2 and 5-HT₂ receptors and the R(-) enantiomer by blocking 5-HT₃ receptors.

Clinical efficacy and safety

The histamine H₁-antagonistic activity of mirtazapine is associated with its sedative properties. It has practically no anticholinergic activity and, at therapeutic doses, has only limited effects (e.g. orthostatic hypotension) on the cardiovascular system.

The effect of Zispin (mirtazapine) on QTc interval was assessed in a randomized, placebo and moxifloxacin controlled clinical trial involving 54 healthy volunteers using a regular dose of 45 mg and a supra-therapeutic dose of 75 mg. Linear e-max modelling suggested that prolongation of QTc- intervals remained below the threshold for clinically meaningful prolongation (see section 4.4).

Paediatric population

Two randomised, double-blind, placebo-controlled trials in children aged between 7 and 18 years with major depressive disorder (n=259) using a flexible dose for the first 4 weeks (15-45 mg mirtazapine) followed by a fixed dose (15, 30 or 45 mg mirtazapine) for another 4 weeks failed to demonstrate significant differences between mirtazapine and placebo on the primary and all secondary endpoints. Significant weight gain ($\geq 7\%$) was observed in 48.8 % of the Zispin treated subjects compared to 5.7 % in the placebo arm. Urticaria (11.8 % vs. 6.8 %) and hypertriglyceridaemia (2.9 % vs. 0 %) were also commonly observed.

5.2 Pharmacokinetic properties

Absorption

After oral administration of Zispin, the active substance mirtazapine is rapidly and well absorbed (bioavailability $\approx 50\%$), reaching peak plasma levels after approx. one hour. Food intake has no influence on the pharmacokinetics of mirtazapine.

Distribution

Binding of mirtazapine to plasma proteins is approx. 85 %.

Biotransformation

Major pathways of biotransformation are demethylation and oxidation, followed by conjugation. In vitro data from human liver microsomes indicate that cytochrome P450 enzymes CYP2D6 and CYP1A2 are involved in the formation of the 8-hydroxy metabolite of mirtazapine, whereas CYP3A4 is considered to be responsible for the formation of the N-demethyl and N-oxide metabolites. The demethyl metabolite is pharmacologically active and appears to have the same pharmacokinetic profile as the parent compound.

Elimination

Mirtazapine is extensively metabolized and eliminated via the urine and faeces within a few days. The mean half-life of elimination is 20–40 hours; longer half-lives, up to 65 hours, have occasionally been recorded and shorter half-lives have been seen in young men. The half-life of elimination is sufficient to justify once-a-day dosing. Steady state is reached after 3–4 days, after which there is no further accumulation.

Linearity/non-linearity

Mirtazapine displays linear pharmacokinetics within the recommended dose range.

Special populations

The clearance of mirtazapine may be decreased as a result of renal or hepatic impairment.

5.3 Preclinical safety data

Non-clinical data reveal no special hazard for humans based on conventional studies of safety pharmacology, repeated dose toxicity, genotoxicity, carcinogenic potential, toxicity to reproduction and development.

In reproductive toxicity studies in rats and rabbits no teratogenic effects were observed. At two-fold systemic exposure compared to maximum human therapeutic exposure, there was an increase in post-implantation loss, decrease in the pup birth weights, and reduction in pup survival during the first three days of lactation in rats.

Mirtazapine was not genotoxic in a series of tests for gene mutation and chromosomal and DNA damage. Thyroid gland tumours found in a rat carcinogenicity study and hepatocellular neoplasms found in a mouse carcinogenicity study are considered to be species-specific, non-genotoxic responses associated with long-term treatment with high doses of hepatic enzyme inducers.

6 PHARMACEUTICAL PARTICULARS

6.1 List of excipients

L-methionine
sodium benzoate (E211)

saccharin sodium (E954)
citric acid monohydrate (E330)
glycerol (E422)
maltitol liquid (E965)
orange tangerine flavour No. PHL-132597 (contains ethanol)
purified water

6.2 Incompatibilities

The oral solution should not be mixed with fluids other than water.

6.3 Shelf life

2 years
Shelf life after *first* opening of the bottle: 6 weeks

6.4 Special precautions for storage

Do not store above 25°C.

6.5 Nature and contents of container

The carton contains one brown (type III) glass bottle containing 66ml of Zispin oral solution and one metering pump. The supplied bottle with Zispin oral solution is closed with a sealed, polypropylene screw cap which has child-resistant features. The supplied metering pump is packed in a sealed polyethylene bag.

6.6 Special precautions for disposal and other handling

No special requirements.

7 MARKETING AUTHORISATION HOLDER

Merck Sharp & Dohme Ireland (Human Health) Limited
Red Oak North
South County Business Park
Leopardstown
Dublin 18

8 MARKETING AUTHORISATION NUMBER

PA1286/047/004

9 DATE OF FIRST AUTHORISATION/RENEWAL OF THE AUTHORISATION

Date of first authorisation: 12 January 2001

Date of last renewal: 8 February 2013

10 DATE OF REVISION OF THE TEXT

February 2017