

NEW ZEALAND DATA SHEET

1. PRODUCT NAME

DIFLUCAN® 10 mg/mL, 40 mg/mL powder for oral suspension.

DIFLUCAN® 50 mg, 100 mg, 150 mg, 200 mg capsules.

DIFLUCAN® 100 mg/50 mL solution for infusion.

2. QUALITATIVE AND QUANTITATIVE COMPOSITION

Powder for oral suspension

Each mL of reconstituted suspension contains 10 mg fluconazole.

Capsules

Each gelatin capsule contains 50 mg, 100 mg, 150 mg or 200 mg fluconazole.

Solution for infusion

Each vial of 50 mL solution for infusion contains 100 mg fluconazole (2 mg/mL) in 0.9% saline solution.

Excipient(s) with known effect

Powder for oral suspension

0.58 g sucrose and 1.13 mg sodium per mL of reconstituted suspension.

Capsules

Each 50 mg, 100 mg, 150 mg and 200 mg capsule contains 49.707, 99.413, 149.12 mg and 198.826 lactose monohydrate, respectively.

Solution for infusion

Each mL contains 9 mg sodium chloride (equivalent to 0.154 mmol sodium) (see section 4.4 Special warnings and precautions for use). For the full list of excipients, see section 6.1 List of excipients.

3. PHARMACEUTICAL FORM

Powder for oral suspension

White to off-white powder for oral suspension providing a white to off-white, orange-flavoured suspension after reconstitution.

Capsules

Diflucan 50 mg capsule has a light turquoise blue opaque cap and white opaque body, marked with the Pfizer logo and FLU-50.

Diflucan 100 mg capsule has a standard blue opaque cap and white opaque body, marked with the Pfizer logo and FLU-100.

Diflucan 150 mg capsule has a light turquoise blue opaque cap and body, marked with the Pfizer logo and FLU-150.

Diflucan 200 mg capsule has purple opaque cap and white opaque body, marked with the Pfizer logo and FLU-200.

Solution for infusion

Clear, colourless solution with no visible particles. The pH of the solution is 4.0 - 8.0.

4. CLINICAL PARTICULARS

4.1 Therapeutic indications

Diflucan is indicated for the treatment of the following conditions:

Cryptococcosis, including cryptococcal meningitis and infections of other sites (e.g., pulmonary, cutaneous). Normal hosts, and patients with AIDS, organ transplants or other causes of immunosuppression may be treated. Diflucan can be used as maintenance therapy to prevent relapse of cryptococcal disease in patients with AIDS.

Systemic candidiasis including candidaemia, disseminated candidiasis and other forms of invasive candidal infection including infections of the peritoneum, endocardium and pulmonary and urinary tracts. Patients with malignancy, in intensive care units, receiving cytotoxic or immunosuppressive therapy, or with other factors predisposing to candidal infection may be treated.

Mucosal candidiasis. These include oropharyngeal, oesophageal, non-invasive bronchopulmonary infections, candiduria, mucocutaneous and chronic oral atrophic candidiasis (denture sore mouth). Normal hosts and patients with compromised immune function may be treated.

Vaginal candidiasis, acute or recurrent.

Prevention of fungal infection in immunocompromised patients considered at risk as a consequence of HIV infections or neutropenia following cytotoxic chemotherapy, radiotherapy or bone marrow transplant.

Dermatomycoses including tinea pedis, tinea corporis, tinea cruris, pityriasis versicolor and candidiasis.

Diflucan solution for infusion is indicated for the same conditions in patients, but should be used only when Diflucan cannot be administered orally.

4.2 Dose and method of administration

Dose

Diflucan is normally administered orally. If oral administration is not possible, it may be administered by intravenous infusion (see Method of administration below for rate of infusion).

The daily dose of Diflucan should be based on the infecting organism, severity of the fungal infection and the patient's response to therapy. Most cases of vaginal candidiasis respond to single dose therapy. Therapy for those types of infections requiring multiple dose treatment should be continued until clinical parameters or laboratory tests indicate that active fungal infection has subsided. An inadequate period of treatment may lead to recurrence of active infection. Patients with AIDS and cryptococcal meningitis or recurrent oropharyngeal candidiasis usually require maintenance therapy to prevent relapse.

Adults

Cryptococcal meningitis and cryptococcal infections at other sites

The usual dose is 400 mg on the first day followed by 200 to 400 mg once daily. Duration of treatment for cryptococcal infections will depend on the clinical and mycological response, but is usually at least 6-8 weeks for cryptococcal meningitis.

Prevention of relapse of cryptococcal meningitis in AIDS patients

After the patient receives a full course of primary therapy, Diflucan may be administered indefinitely at a once daily dose of 200 mg.

Candidaemia, disseminated candidiasis and other invasive candidal infections

The usual dose is 400 mg on the first day followed by 200 mg once daily. Depending on the clinical response, the dose may be increased to 400 mg once daily. Duration of treatment is based upon the clinical response.

Oropharyngeal candidiasis

The usual dose is 50 mg once daily for 7-14 days. If necessary, treatment can be continued for longer periods in patients with severely compromised immune function. For atrophic oral candidiasis associated with dentures the usual dose is 50 mg once daily for 14 days administered concurrently with local antiseptic measures to the denture.

Other candidal infections of mucosa (except vaginal candidiasis, see below), e.g., oesophagitis, candiduria, mucocutaneous candidiasis etc.

The usual effective dose is 50 mg once daily, given for 14-30 days.

In unusually difficult cases of mucosal candidal infections the dose may be increased to 100 mg daily.

Vaginal candidiasis

Diflucan 150 mg should be administered as a single oral dose.

Median time to onset of symptom relief following a 150 mg single oral dose for the treatment of vaginal candidiasis is one day. The range of time to onset of symptom relief is one hour to nine days.

Prevention of fungal infections in immunocompromised patients

The dose should be 50 mg once daily while the patient is at risk as a consequence of receiving cytotoxic chemotherapy, radiotherapy or bone marrow transplant. A higher dose of 100 mg/day may be used in patients at risk of severe recurrent infections.

Dermatomycoses

The usual dosage is 50 mg once daily or 150mg once weekly for two to four weeks. Tinea pedis may require treatment for up to six weeks.

Paediatrics

As with similar infections in adults, the duration of treatment is based on the clinical and mycological response. Diflucan is administered as a single dose each day.

Mucosal candidiasis

3 mg/kg once daily. A loading dose of 6 mg/kg may be used on the first day to achieve steady state levels more rapidly.

Systemic candidiasis and cryptococcal infection

6-12 mg/kg once daily, depending on the severity of the disease.

Prevention of fungal infections in immunocompromised patients considered at risk as a consequence of neutropenia following cytotoxic chemotherapy or radiotherapy

3 - 12 mg/kg once daily, depending on the extent and duration of the induced neutropenia (see adult dosing).

Paediatrics 4 weeks of age and younger

Neonates excrete fluconazole slowly. In the first two weeks of life the same mg/kg dosing as in older children should be used but administered every 72 hours. During weeks 3 and 4 of life the same dose should be given every 48 hours.

Method of administration

Diflucan may be administered either orally (Capsules and Powder for oral suspension) or by intravenous infusion (Solution for infusion), the route being dependent on the clinical state of the patient. On transferring from the intravenous to the oral route, or *vice versa*, there is no need to change the daily dose.

Diflucan can be taken with or without food.

If oral administration is not possible, it may be administered by intravenous infusion at a rate not exceeding 200 mg/hour, given as a constant infusion. Diflucan infusion has been used safely for up to fourteen days of intravenous therapy. Since oral absorption is rapid and almost complete, there is no need to change the daily dosage on transferring from the intravenous to the oral route or *vice versa*.

If Diflucan infusion is administered to patients requiring sodium or fluid restriction, consideration should be given to the salt content of the infusion fluid (7.5 mmol/50 mL) and the total volume of fluid administered.

Diflucan infusions are intended only for intravenous administration using sterile equipment.

Diflucan intravenous infusion is compatible with the following:

- Ringer's solution
- Normal saline
- Dextrose 20%
- Hartmann's solution
- Potassium chloride in dextrose
- Sodium bicarbonate 4.2%
- Aminofusin

Diflucan may be infused through an existing line with one of the above listed fluids. Although no specific incompatibilities have been noted, mixing with any other drug prior to infusion is not recommended.

Parenteral drug products should be inspected visually for particulate matter and discoloration prior to administration whenever solution and container permit. Do not use if the solution is cloudy or precipitated or if the seal is not intact.

Dosage adjustments

Elderly

Where there is no evidence of renal impairment, normal dosage recommendations should be adopted. For patients with renal impairment (creatinine clearance < 50 mL/min) the dosage schedule should be adjusted as described below.

Adult patients with renal impairment

Fluconazole is predominantly excreted in the urine as unchanged drug. No adjustments in single dose therapy are necessary.

In patients with impaired renal function who will receive multiple doses of fluconazole, an initial loading dose of 50 mg to 400 mg should be given. After the loading dose, the daily dose (according to indication) should be based on the following table.

Creatinine Clearance (mL/min)	Percent of Recommended Dose
> 50	100%
11 – 50	50%
Patients receiving haemodialysis	One dose after every haemodialysis session.

When serum creatinine is the only measure of renal function available, the following formula (based on sex, weight, and age of patient) should be used to estimate the creatinine clearance in mL/minute.

Males	$\frac{\text{Weight (kg)} \times (140 - \text{age}) \times 0.0885}{72 \times \text{serum creatinine (mmol/L)}}$
Females	0.85 x above value

Paediatrics with renal impairment

For children with impaired renal function the daily dose should be reduced in accordance with the guidelines given for adults.

4.3 Contraindications

Diflucan should not be used in patients with known sensitivity to fluconazole; to related azole compounds; or to any of its excipients.

Coadministration of terfenadine is contraindicated in patients receiving fluconazole at multiple doses of 400 mg/day or higher based upon results of a multiple dose interaction study. Co-administration of other drugs known to prolong the QT interval and which are metabolised via the enzyme CYP3A4 such as cisapride, astemizole, erythromycin, pimozide and quinidine is contraindicated in patients receiving fluconazole (see sections 4.4 Special warnings and precautions for use and 4.5 Interactions with other medicines and other forms of interactions).

4.4 Special warnings and precautions for use

In rare cases, as with other azoles, anaphylaxis has been reported.

Fluconazole should be administered with caution to patients with liver dysfunction.

Fluconazole has been associated with rare cases of serious hepatic toxicity including fatalities, primarily in patients with serious underlying medical conditions. In cases of fluconazole-associated hepatotoxicity, no obvious relationship to total daily dose, duration of therapy, sex or age of patient has been observed.

Patients who develop abnormal liver function tests during Diflucan therapy should be monitored for the development of more severe hepatic injury. Diflucan should be discontinued if clinical signs and symptoms consistent with liver disease develop that may be attributable to fluconazole (see section 4.8 Undesirable effects).

Patients have rarely developed exfoliative cutaneous reactions, such as Stevens-Johnson syndrome and toxic epidermal necrolysis, during treatment with Diflucan. Drug reaction with eosinophilia and systemic symptoms (DRESS) has been reported. AIDS patients are more prone to the development of serious cutaneous reactions to many drugs. If rash which is attributable to fluconazole develops in a patient treated for a superficial fungal infection, Diflucan should be discontinued. If patients with invasive/systemic fungal infections develop rashes, they should be monitored closely and Diflucan discontinued if bullous lesions or erythema multiforme develop (see section 4.8 Undesirable effects).

Some azoles, including fluconazole, have been associated with prolongation of the QT interval on the electrocardiogram. Fluconazole causes QT prolongation via the inhibition of Rectifier Potassium Channel current (I_{Kr}). The QT prolongation caused by other medicinal products (such as amiodarone) may be amplified via the inhibition of cytochrome P450 (CYP) 3A4 (see section 4.5 Interactions with other medicines and other forms of interactions). During post-marketing surveillance, there have been very rare cases of QT prolongation and torsade de pointes in patients taking fluconazole. These reports included seriously ill patients with multiple confounding risk factors, such as structural heart disease, electrolyte abnormalities and concomitant medications that may have been contributory. Patients with hypokalaemia and advanced cardiac failure are at an increased risk for the occurrence of life-threatening

ventricular arrhythmias and torsades de pointes. Fluconazole should be administered with caution to patients with these potentially proarrhythmic conditions (see section 4.8 Undesirable effects). Fluconazole should be administered with caution to patients with renal dysfunction.

Fluconazole is a moderate CYP2C9 inhibitor and a moderate CYP3A4 inhibitor. Fluconazole is also an inhibitor of the isoenzyme CYP2C19. Fluconazole treated patients who are concomitantly treated with drugs with a narrow therapeutic window metabolised through CYP2C9, CYP2C19 and CYP3A4 should be monitored (see section 4.5 Interactions with other medicines and other forms of interactions).

Adrenal insufficiency has been reported in patients receiving other azoles (e.g., ketoconazole).

Reversible cases of adrenal insufficiency were reported in patients receiving fluconazole.

Diflucan capsules contain lactose and should not be given to patients with rare hereditary problems of galactose intolerance, Lapp lactase deficiency or glucose-galactose malabsorption.

Diflucan powder for oral suspension contains sucrose and should not be used in patients with hereditary fructose, glucose/galactose malabsorption and sucrose-isomaltase deficiency.

Candidiasis

Studies have shown an increasing prevalence of infections with *Candida* species other than *C. albicans*. These are often resistant (e.g., *C. krusei* and *C. auris*) or show reduced susceptibility to fluconazole (*C. glabrata*). Such infections may require alternative antifungal therapy secondary to treatment failure. Therefore, prescribers are advised to take into account the prevalence of resistance in various *Candida* species to fluconazole (see section 5.1 Pharmacodynamic properties).

4.5 Interaction with other medicines and other forms of interaction

Pharmacokinetic interactions

Fluconazole is an inhibitor of the cytochrome P450 system, particularly the CYP 2C and to a lesser extent the CYP 3A isoforms. *In vitro* studies conducted in human hepatic microsomes, demonstrate that the extent of inhibition of CYP 3A isoforms is lowest with fluconazole, when compared with ketoconazole and itraconazole. In addition to the observed /documented interactions mentioned below, co-administration of fluconazole with other drugs metabolised primarily by these P450 isoforms may result in altered plasma concentrations of these drugs that could change therapeutic effects and/or adverse event profiles.

Clinically or potentially significant drug interactions observed between fluconazole and the following agents: short acting benzodiazepines, cisapride, coumarin-type anticoagulants, ciclosporin, hydrochlorothiazide, oral hypoglycaemics, phenytoin, rifampicin, rifabutin, tacrolimus and theophylline. These are described in greater detail below.

Effects of Other Medicinal Products on Fluconazole

The exposure to fluconazole is significantly increased by the concomitant administration of the following agent:

Hydrochlorothiazide

Concomitant oral administration of 100 mg fluconazole and 50 mg hydrochlorothiazide for 10 days in normal volunteers resulted in an increase of 41% in C_{max} and an increase of 43% in area under the concentration versus time curve (AUC) of fluconazole, compared to fluconazole given alone. Overall the plasma concentrations of fluconazole were approximately 3.26 - 6.52 $\mu\text{mol/L}$ higher with concomitant diuretic. These changes are attributable to a mean net reduction of approximately 20% in renal clearance of fluconazole.

The exposure to fluconazole is significantly decreased by the concomitant administration of the following agent:

Rifampicin

Administration of a single oral 200 mg dose of fluconazole after chronic rifampicin administration resulted in a 25% decrease in AUC and a 20% shorter half-life of fluconazole in normal volunteers. Depending on clinical circumstances, an increase of the dose of Diflucan should be considered when it is administered with rifampicin.

Minor or no significant pharmacokinetic interactions that require no dosage adjustment:

Gastrointestinal drugs

In fasted normal volunteers, absorption of orally administered fluconazole does not appear to be affected by agents that increase gastric pH. Single dose administration of fluconazole (100 mg) with cimetidine (400 mg) resulted in a 13% reduction in AUC and 21% reduction in C_{max} of fluconazole. Administration of an antacid containing aluminium and magnesium hydroxides immediately prior to a single dose of fluconazole (100 mg) had no effect on the absorption or elimination of fluconazole.

Effects of Fluconazole on Other Medicinal Products

As fluconazole is a potent inhibitor of CYP2C9, CYP2C19 and moderate inhibitor of CYP 3A4, particular caution should be exercised when fluconazole is co-administered with other compounds metabolised by these isoenzymes and these patients should be carefully monitored. The enzyme inhibiting effect of fluconazole persists 4 to 5 days after discontinuation of fluconazole treatment due to the long half-life of fluconazole (see section 4.3 Contraindications).

Alfentanil

A study observed a reduction in clearance and distribution volume as well as prolongation of $t_{1/2}$ of alfentanil following concomitant treatment with fluconazole. A possible mechanism of action is fluconazole's inhibition of CYP3A4. Dosage adjustment of alfentanil may be necessary.

Amitriptyline, nortriptyline

Fluconazole increases the effect of amitriptyline and nortriptyline. 5-Nortriptyline and/or S-amitriptyline may be measured at initiation of the combination therapy and after 1 week. Dosage of amitriptyline/nortriptyline should be adjusted, if necessary.

Amphotericin B

Concurrent administration of fluconazole and amphotericin B in infected normal and immunosuppressed mice showed the following results: a small additive antifungal effect in systemic infection with *Candida albicans*, no interaction in intracranial infection with *Cryptococcus neoformans*, and antagonism of the two drugs in systemic infection with *Aspergillus fumigatus*. The clinical significance of results obtained in these studies is unknown.

Concomitant use of the following agents with fluconazole is contraindicated:

Astemizole

Concomitant administration of fluconazole with astemizole may decrease the clearance of astemizole. Resulting increased plasma concentrations of astemizole can lead to QT prolongation and rare occurrences of *torsade de pointes*. Coadministration of fluconazole and astemizole is contraindicated (see section 4.3 Contraindications).

Cisapride

There have been reports of cardiac events including torsade de pointes in patients to whom fluconazole and cisapride were coadministered. In most of these cases, the patients appear to have been predisposed to arrhythmias or had serious underlying illness. A controlled study found that concomitant fluconazole 200 mg once daily and cisapride 20 mg four times a day yielded a significant increase in cisapride plasma levels and prolongation of QTc interval. Coadministration of cisapride is contraindicated in patients receiving fluconazole (see section 4.3 Contraindications).

Erythromycin

Concomitant use of fluconazole and erythromycin has the potential to increase the risk of cardiotoxicity (prolonged QT interval, torsade de pointes) and consequently sudden heart death. This combination should be avoided.

Pimozide

Although not studied *in vitro* or *in vivo*, concomitant administration of fluconazole with pimozide may result in inhibition of pimozide metabolism. Increased pimozide plasma concentrations can lead to QT prolongation and rare occurrences of torsade de pointes. Coadministration of fluconazole and pimozide is contraindicated (see section 4.3 Contraindications).

Quinidine

Although not studied *in vitro* or *in vivo*, concomitant administration of fluconazole with quinidine may result in inhibition of quinidine metabolism. Use of quinidine has been associated with QT prolongation and rare occurrences of *torsade de pointes*. Coadministration of fluconazole and quinidine is contraindicated.

Terfenadine

Because of the occurrence of serious cardiac dysrhythmias secondary to prolongation of the QTc interval in patients receivingazole antifungals in conjunction with terfenadine, interaction studies have been performed. One study at a 200 mg daily dose of fluconazole failed to

demonstrate a prolongation in QTc interval. Another study at a 400 mg and 800 mg daily dose of fluconazole demonstrated that fluconazole taken in doses of 400 mg/day or greater significantly increases plasma levels of terfenadine when taken concomitantly. The combined use of fluconazole at doses of 400 mg or greater with terfenadine is contraindicated. The coadministration of fluconazole at doses lower than 400 mg/day with terfenadine should be carefully monitored (see section 4.3 Contraindications).

Concomitant use that should be avoided or used with caution:

Amiodarone

Concomitant administration of fluconazole with amiodarone may increase QT prolongation. Caution must be exercised if the concomitant use of fluconazole and amiodarone is necessary, notably with high-dose fluconazole (800 mg).

Lemborexant

Concomitant administration of fluconazole increased lemborexant C_{max} and AUC by approximately 1.6- and 4.2-fold, respectively which is expected to increase risk of adverse reactions, such as somnolence. Avoid concomitant use of lemborexant.

Interaction of fluconazole with the following agents may result in increased exposure to these drugs. Careful monitoring and/or dosage adjustment should be considered:

Anticoagulants

Careful monitoring of prothrombin time in patients receiving fluconazole and indanedione anticoagulants is recommended.

Benzodiazepines (short acting)

Studies in human subjects have reported changes in midazolam pharmacokinetics and clinical effects that are dependent on dosage and route of administration. Single doses of fluconazole 150 mg resulted in modest increases in midazolam concentrations and psychomotor effects following oral administration of 10 mg that may not be clinically significant. At doses used to treat systemic mycoses, fluconazole resulted in substantial increases in midazolam concentrations and psychomotor effects following oral administration of midazolam 7.5 mg, but only modest increases that are not likely to be clinically significant following intravenous infusion of midazolam 0.05 mg/kg.

This effect on midazolam appears to be more pronounced following oral administration of fluconazole than with fluconazole administered intravenously. There have been reports of sleepiness and disturbed consciousness in patients taking fluconazole for systemic mycoses and triazolam; however, in most of these cases the patients had serious underlying illnesses and/or concomitant therapies that could have contributed to the reported events, and a relationship to a fluconazole-triazolam interaction is uncertain. If concomitant benzodiazepine therapy is necessary in patients being treated with Diflucan, consideration should be given to decreasing the benzodiazepine dosage, and the patients should be appropriately monitored. Fluconazole increases the area under the concentration versus time curve (AUC) of triazolam (single dose) by approximately 50% C_{max} by 20% to 32% and increases the half life by 25% to 50% due to the inhibition of metabolism of triazolam. Dosage adjustments of triazolam may be necessary.

Calcium channel blockers

Certain calcium channel antagonists (nifedipine, isradipine, amlodipine, verapamil and felodipine) are metabolised by CYP3A4. Fluconazole has the potential to increase the systemic exposure of the calcium channel antagonists. Frequent monitoring for adverse events is recommended.

Carbamazepine

Azole antifungals may raise carbamazepine plasma concentrations. Since high plasma concentrations of carbamazepine and/or carbamazepine-10, 11-epoxy may result in adverse effects (e.g., dizziness, drowsiness, ataxia, diplopia), the dosage of carbamazepine should be adjusted accordingly and/or plasma concentrations monitored when used concomitantly with fluconazole.

Celecoxib

During concomitant treatment with fluconazole (200 mg daily) and celecoxib (200 mg) the celecoxib C_{max} and AUC increased by 68% and 134%, respectively. Half of the celecoxib dose may be necessary when combined with fluconazole.

Ciclosporin

Fluconazole significantly increases the concentration and AUC of ciclosporin. This combination may be used by reducing the dosage of ciclosporin depending on ciclosporin concentration.

Cyclophosphamide

Combination therapy with cyclophosphamide and fluconazole results in an increase in serum bilirubin and serum creatinine. The combination may be used while taking increased consideration to the risk of increased serum bilirubin and serum creatinine.

Fentanyl

One fatal case of possible fentanyl fluconazole interaction was reported. The author judged that the patient died from fentanyl intoxication. Furthermore, in a randomised crossover study with 12 healthy volunteers it was shown that fluconazole delayed the elimination of fentanyl significantly. Elevated fentanyl concentration may lead to respiratory depression.

Halofantrine

Fluconazole can increase halofantrine plasma concentration due to an inhibitory effect on CYP3A4.

HMG-CoA reductase inhibitors

The risk of myopathy and rhabdomyolysis increases (dose-dependent) when fluconazole is coadministered with HMG-CoA reductase inhibitors metabolised through CYP3A4, such as atorvastatin and simvastatin, or through CYP2C9, such as fluvastatin (decreased hepatic metabolism of the statin). If concomitant therapy is necessary, the patient should be observed for symptoms of myopathy and rhabdomyolysis and creatine kinase should be monitored. HMG-CoA reductase inhibitors should be discontinued if a marked increase in creatine kinase

is observed or myopathy/rhabdomyolysis is diagnosed or suspected. Lower doses of HMG-CoA reductase inhibitors may be necessary as instructed in the statins prescribing information.

Ibrutinib

Moderate inhibitors of CYP3A4 such as fluconazole increase plasma ibrutinib concentrations and may increase risk of toxicity. If the combination cannot be avoided, reduce the dose of ibrutinib as instructed in ibrutinib prescribing information and provide close clinical monitoring.

Ivacaftor (alone or combined with drugs in the same therapeutic class)

Coadministration with ivacaftor, a cystic fibrosis transmembrane conductance regulator (CFTR) potentiator, increased ivacaftor exposure by 3-fold and hydroxymethyl-ivacaftor (M1) exposure by 1.9-fold. A reduction of the ivacaftor (alone or combined) dose is necessary as instructed in the ivacaftor (alone or combined) prescribing information.

Lurasidone

Moderate inhibitors of CYP3A4 such as fluconazole may increase lurasidone plasma concentrations. If concomitant use cannot be avoided, reduce the dose of lurasidone as instructed in the lurasidone prescribing information.

Losartan

Fluconazole inhibits the metabolism of losartan to its active metabolite (E-31 74) which is responsible for most of the angiotensin II-receptor antagonism that occurs during treatment with losartan. Patients should have their blood pressure monitored continuously.

Methadone

Fluconazole may enhance the serum concentration of methadone. Dosage adjustment of methadone may be necessary.

Non-steroidal anti-inflammatory drugs

Although not specifically studied, fluconazole has the potential to increase the systemic exposure of other non-steroidal anti-inflammatory drugs (NSAIDs) that are metabolised by CYP2C9 (e.g., naproxen, lornoxicam, meloxicam, diclofenac). Frequent monitoring for adverse events and toxicity related to NSAIDs is recommended. Adjustment of dosage of NSAIDs may be needed.

Olaparib

Moderate inhibitors of CYP3A4 such as fluconazole increase olaparib plasma concentrations; concomitant use is not recommended. If the combination cannot be avoided, limit the dose of olaparib to 200 mg twice daily.

Oral hypoglycaemic agents

The effects of fluconazole on the pharmacokinetics of the sulphonylurea oral hypoglycaemic agents tolbutamide, glipizide and glibenclamide were examined in three placebo-controlled crossover studies in normal volunteers. All subjects received the sulphonylurea alone and

following treatment with 100 mg of fluconazole as a single daily oral dose for 7 days. Fluconazole administration resulted in significant increases in C_{max} and AUC of the sulphonylurea. Several subjects in these three studies experienced symptoms consistent with hypoglycaemia. In the glibenclamide study, several volunteers required oral glucose treatment. When Diflucan and sulphonylureas are coadministered, blood glucose concentrations should be monitored carefully and the dose of the sulphonylurea adjusted accordingly.

Phenytoin

Fluconazole inhibits the hepatic metabolism of phenytoin. With coadministration, serum phenytoin concentration levels should be monitored in order to avoid phenytoin toxicity.

Prednisone

There was a case report that a liver-transplanted patient treated with prednisone developed acute adrenal cortex insufficiency when a 3 month therapy with fluconazole was discontinued. The discontinuation of fluconazole presumably caused an enhanced CYP3A4 activity which led to increased metabolism of prednisone. Patients on long-term treatment with fluconazole and prednisone should be carefully monitored for adrenal cortex insufficiency when fluconazole is discontinued.

Rifabutin

There have been reports that an interaction exists when fluconazole is administered concomitantly with rifabutin, leading to increased serum levels of rifabutin. There have been reports of uveitis in patients to whom fluconazole and rifabutin were coadministered. Patients receiving rifabutin and Diflucan concomitantly should be carefully monitored.

Saquinavir

Fluconazole increases the AUC of saquinavir and decreases the clearance of saquinavir due to inhibition of saquinavir's hepatic metabolism by CYP3A4 and inhibition of P-glycoprotein. Dosage adjustment of saquinavir may be necessary.

Sirolimus

Fluconazole increases plasma concentrations of sirolimus presumably by inhibiting the metabolism of sirolimus via CYP3A4 and P-glycoprotein. This combination may be used with a dosage adjustment of sirolimus depending on the effect/concentration measurements.

Sulphonylureas

Fluconazole has been shown to prolong the serum half-life of concomitantly administered oral sulphonylureas (e.g., chlorpropamide, glibenclamide, glipizide, tolbutamide) in healthy volunteers. Frequent monitoring of blood glucose and appropriate reduction of sulphonylurea dosage are recommended during coadministration.

Tacrolimus

Fluconazole may increase the serum concentrations of orally administered tacrolimus up to 5 times due to inhibition of tacrolimus metabolism through CYP3A4 in the intestines. No significant pharmacokinetic changes have been observed when tacrolimus is given

intravenously. Increased tacrolimus levels have been associated with nephrotoxicity. Dosage of orally administered tacrolimus should be decreased depending on tacrolimus concentration.

Theophylline

In a placebo controlled interaction study, the administration of fluconazole 200 mg for 14 days resulted in an 18% decrease in the mean plasma clearance of theophylline. Patients who are receiving high dose theophylline or who are otherwise at increased risk of theophylline toxicity should be observed for signs of theophylline toxicity while receiving Diflucan, and therapy modified appropriately if signs of toxicity develop.

Tofacitinib

Exposure of tofacitinib is increased when tofacitinib is coadministered with medications that result in both moderate inhibition of CYP3A4 and potent inhibition of CYP2C19 (e.g., fluconazole). Dosage adjustment of tofacitinib may be necessary.

Tolvaptan

Exposure to tolvaptan is significantly increased (200% in AUC; 80% in C_{max}) when tolvaptan, a CYP3A4 substrate, is co-administered with fluconazole, a moderate CYP3A4 inhibitor, with risk of significant increase in adverse effects particularly significant diuresis, dehydration and acute renal failure. In case of concomitant use, the tolvaptan dose should be reduced and the patient managed cautiously.

Vinca alkaloids

Although not studied, fluconazole may increase the plasma levels of the vinca alkaloids (e.g., vincristine and vinblastine) and lead to neurotoxicity, which is possibly due to an inhibitory effect on CYP3A4.

Vitamin A

Based on a case-report in one patient receiving combination therapy with all-trans-retinoid acid (an acid form of vitamin A) and fluconazole, central nervous system (CNS) related undesirable effects have developed in the form of pseudotumour cerebri, which disappeared after discontinuation of fluconazole treatment. This combination may be used but the incidence of CNS related undesirable effects should be borne in mind.

Voriconazole (CYP2C9, CYP2C19 and CYP3A4 inhibitor)

Concurrent administration of oral voriconazole (400 mg Q12h for 1 day, then 200 mg Q12h for 2.5 days) and oral fluconazole (400 mg on day 1, then 200 mg Q24h for 4 days) to 6 healthy male subjects resulted in an increase in C_{max} and AUC, of voriconazole by an average of 57% (90% CI: 20%, 107%) and 79% (90% CI: 40%, 128%), respectively. In a follow-on clinical study involving 8 healthy male subjects, reduced dosing and/or frequency of voriconazole and fluconazole did not eliminate or diminish this effect. Concomitant administration of voriconazole and fluconazole at any dose is not recommended.

Warfarin

A single dose of warfarin (15 mg) given to normal volunteers, following 14 days of orally administered fluconazole (200 mg) resulted in a 12% increase in the prothrombin time response

(area under the prothrombin time-time curve). One of 13 subjects experienced a 2-fold increase in his prothrombin time response. In post-marketing experience, as with other azole antifungals, bleeding events (bruising, epistaxis, gastrointestinal bleeding, haematuria and melaena) have been reported in association with increases in prothrombin time in patients receiving fluconazole concurrently with warfarin. Careful monitoring of prothrombin time in patients receiving fluconazole and coumarin-type anticoagulants is recommended.

Zidovudine

Two kinetic studies resulted in increased levels of zidovudine most likely caused by the decreased conversion of zidovudine to its major metabolite. One study determined zidovudine levels in AIDS or ARC patients before and following fluconazole 200 mg daily for 15 days. There was a significant increase in zidovudine AUC (20%). A second randomised, two-period, two-treatment crossover study examined zidovudine levels in HIV infected patients. On two occasions, 21 days apart, patients received zidovudine 200 mg every eight hours either with or without fluconazole 400 mg daily for seven days. The AUC of zidovudine significantly increased (74%) during co-administration with fluconazole. Patients receiving this combination should be monitored for the development of zidovudine-related adverse reactions.

Minor or no significant pharmacokinetic interactions that require no dosage adjustment:

Oral contraceptives

Three kinetic studies with a combined oral contraceptive have been performed using multiple doses of fluconazole. There were no relevant effects on either hormone level in the 50 mg fluconazole study, while at 200 mg daily, the AUCs of ethinyl estradiol and levonorgestrel were increased 40% and 24%, respectively. In a 300 mg once weekly fluconazole study, the AUCs of ethinyl estradiol and norethindrone were increased by 24% and 13%, respectively. Thus, multiple dose use of fluconazole at these doses is unlikely to have an effect on the efficacy of the combined oral contraceptive.

Two-way Interactions

Minor or no significant pharmacokinetic interactions that require no dosage adjustment:

Azithromycin

An open-label, randomised, three-way crossover study in 18 healthy subjects assessed the effect of a single 1200 mg oral dose of azithromycin on the pharmacokinetics of a single 800 mg oral dose of fluconazole as well as the effects of fluconazole on the pharmacokinetics of azithromycin. There was no significant pharmacokinetic interaction between fluconazole and azithromycin.

The estimated ratio of the mean AUC of fluconazole coadministered with azithromycin to fluconazole administered alone was 101%. The estimated ratio of the mean AUC of azithromycin coadministered with fluconazole to azithromycin administered alone was 107%. The estimated ratio of the mean C_{max} of fluconazole coadministered with azithromycin to fluconazole administered alone was 104%. The estimated ratio of the mean C_{max} of azithromycin coadministered with fluconazole to azithromycin administered alone was 82%.

4.6 Fertility, pregnancy and lactation

Fertility

Fluconazole did not affect the fertility of male or female rats treated orally with daily doses of 5 mg/kg, 10 mg/kg or 20 mg/kg or with parenteral doses of 5 mg/kg, 25 mg/kg or 75 mg/kg, although the onset of parturition was slightly delayed at 20 mg/kg p.o. In an intravenous perinatal study in rats at 5 mg/kg, 20 mg/kg and 40 mg/kg, dystocia and prolongation of parturition were observed in a few dams at 20 mg/kg and 40 mg/kg, but not at 5 mg/kg. The disturbances in parturition were reflected by a slight increase in the number of still born pups and decrease of neonatal survival at these dose levels. The effects on parturition in rats are consistent with the species specific oestrogen-lowering property produced by high doses of fluconazole. Such a hormone change has not been observed in women treated with fluconazole.

Pregnancy

Pregnancy category: Category D

Category D: Drugs which have caused, are suspected to have caused or may be expected to cause, an increased incidence of human fetal malformations or irreversible damage. These drugs may also have adverse pharmacological effects. Accompanying texts should be consulted for further details.

Use in pregnancy should be avoided except in patients with severe or potentially life-threatening fungal infections in whom fluconazole may be used if the anticipated benefit outweighs the possible risk to the fetus.

Effective contraceptive measures should be considered in women of child-bearing potential and should continue throughout the treatment period and for approximately 1 week (5 to 6 half-lives) after the final dose.

There have been reports of spontaneous abortion and congenital abnormalities in infants whose mothers were treated with 150 mg of fluconazole as a single or repeated dose in the first trimester.

In one large observational cohort study, first trimester exposure to oral fluconazole was associated with a small increased risk of musculoskeletal malformations, corresponding to approximately 1 additional case per 1000 women treated with cumulative doses \leq 450 mg compared with women treated with topical azoles and to approximately 4 additional cases per 1000 women treated with cumulative doses over 450 mg. The adjusted relative risk was 1.29 (95% CI 1.05 to 1.58) for 150 mg oral fluconazole and 1.98 (95% CI 1.23 to 3.17) for doses over 450 mg fluconazole.

There have been reports of multiple congenital abnormalities in infants whose mothers were being treated for 3 or more months with high dose (400 mg/kg to 800 mg/day) fluconazole therapy for coccidioidomycosis. The relationship between fluconazole use and these events is unclear. Adverse fetal effects have been seen in animals only at high dose levels associated with maternal toxicity. These findings are not considered relevant to fluconazole used at therapeutic doses.

Case reports describe a distinctive and a rare pattern of birth defects among infants whose mothers received high-dose (400 mg/day to 800 mg/day) fluconazole during most or all of the

first trimester of pregnancy. The features seen in these infants include: brachycephaly, abnormal facies, abnormal calvarial development, cleft palate, femoral bowing, thin ribs and long bones, arthrogyposis, and congenital heart disease.

Breastfeeding

Diflucan is found in human breast milk at concentrations similar to plasma. The elimination half-life from breast milk approximates the plasma elimination half-life of 30 hours. The estimated daily infant dose of fluconazole from breast milk (assuming mean milk consumption of 150 ml/kg/day) based on the mean peak milk concentration is 0.39 mg/kg/day, which is approximately 40% of the recommended neonatal dose (<2 weeks of age) or 13% of the recommended infant dose for mucosal candidiasis.

Breast-feeding may be maintained after a single dose of 150 mg fluconazole. Breast-feeding is not recommended after repeated use or after high-dose fluconazole. The developmental and health benefits of breast-feeding should be considered along with the mother's clinical need for Diflucan and any potential adverse effects on the breastfed child from Diflucan or from the underlying maternal condition.

A pharmacokinetic study in 10 lactating women, who had temporarily or permanently stopped breast-feeding their infants, evaluated fluconazole concentrations in plasma and breast milk for 48 hours following a single 150 mg dose of Diflucan. Fluconazole was detected in breast milk at an average concentration of approximately 98% of those in maternal plasma. The mean peak breast milk concentration was 2.61 mg/L at 5.2 hours post-dose.

4.7 Effects on ability to drive and use machines

Experience with Diflucan indicates that therapy is likely to produce minor or moderate adverse effects on the ability to drive or use machinery. When driving vehicles or operating machinery it should be taken into account that occasionally dizziness or seizures may occur.

4.8 Undesirable effects

Adults

Summary of safety profile

Drug reaction with eosinophilia and systemic symptoms (DRESS) has been reported in association with fluconazole treatment (see section 4.4 Special warnings and precautions for use).

The safety profile of fluconazole appears similar in adults and children. The profile established for adults, given different dosage regimens and for different indications, is given below.

Multiple daily dosing for treatment of oral and for oral and oropharyngeal candidiasis; cryptococcal meningitis; or systemic candidiasis.

Diflucan is generally well tolerated. Sixteen percent of over 4000 patients treated in clinical trials of seven days or more experienced adverse events. Treatment was discontinued in 1.5% of patients due to adverse clinical events and in 1.3% due to laboratory abnormalities.

Clinical adverse events were reported more frequently in HIV infected patients (21%) than in non-HIV infected patients (13%). However, the patterns in HIV infected and non-HIV infected

patients were similar. The proportions of patients discontinuing therapy due to clinical adverse events were similar in the two groups (1.5%).

In some patients, particularly those with serious underlying diseases such as AIDS and cancer, changes in renal and haematological function test results and hepatic abnormalities have been observed during treatment with fluconazole and comparative agents, but the clinical significance and relationship to treatment is uncertain.

Hepatobiliary disorders

In combined clinical trials and marketing experience, the spectrum of hepatic reactions has ranged from mild transient elevations in transaminases to clinical hepatitis, cholestasis and fulminant hepatic failure, including fatalities. Elevations in plasma levels of hepatic enzymes have been observed both in otherwise healthy patients and in patients with underlying disease; see section 4.4 Special warnings and precautions for use. There have been rare cases of serious hepatic reactions during treatment with Diflucan (see section 4.4 Special warnings and precautions for use). Instances of fatal hepatic reactions were noted to occur primarily in patients with serious underlying medical conditions (predominantly AIDS or malignancy) and often while taking multiple concomitant medications. In addition, transient hepatic reactions, including hepatitis and jaundice, have occurred among patients with no other identifiable risk factors. In each of these cases, liver function returned to baseline on discontinuation of Diflucan.

In two comparative trials evaluating the efficacy of Diflucan for the suppression of relapse of cryptococcal meningitis, a statistically significant increase was observed in median AST (SGOT) levels from a baseline value of 30 IU/L to 41 IU/L in one trial and 34 IU/L to 66 IU/L in the other. The overall rate of serum transaminase elevations of more than 8 times the upper limit of normal was approximately 1% in fluconazole-treated patients in the pre-marketing clinical trials which included patients with severe underlying disease, predominantly AIDS or malignancies, most of whom were receiving multiple concomitant medications, including many known to be hepatotoxic. The incidence of abnormally elevated serum transaminases was greater in patients taking Diflucan concomitantly with one or more of the following medications; rifampicin, phenytoin, isoniazid, valproic acid, or oral sulphonylurea hypoglycaemic agents.

Other adverse reactions observed included the following:

Common (≥1% and <10%)	
<i>Gastrointestinal disorders</i>	Nausea, vomiting, abdominal pain, diarrhoea.
<i>Nervous system disorders</i>	Headache
Uncommon (≥0.1% to <1%)	
<i>Nervous system disorders</i>	Seizures, dizziness, paraesthesia, taste perversion
<i>Skin and subcutaneous tissue disorders</i>	Rash
Rare (≥0.01% and <0.1%)	
<i>Blood and lymphatic system disorders</i>	Leukopenia (including neutropenia and agranulocytosis), thrombocytopenia
<i>Immunological system disorders</i>	Anaphylaxis, angioedema

<i>Metabolism and nutrition disorders</i>	Hypercholesterolaemia, hypertriglyceridaemia, hypokalaemia
<i>Nervous system disorders</i>	Tremors
<i>Skin and subcutaneous tissue disorders</i>	Angioedema, exfoliative skin disorders including Stevens-Johnson syndrome and toxic epidermal necrolysis (see section 4.3 Contraindications), alopecia

Single 150 mg dose for vaginal candidiasis

Common ($\geq 1\%$ and $< 10\%$)	
<i>Gastrointestinal disorders</i>	Nausea, abdominal pain, diarrhoea, dyspepsia
<i>Hepatobiliary disorders</i>	Alanine aminotransferase increased, aspartate aminotransferase increased, blood alkaline phosphatase increased
<i>Nervous system disorders</i>	Headache
Uncommon ($\geq 0.1\%$ and $< 1\%$)	
<i>Eye disorders</i>	Abnormal vision
<i>Gastrointestinal disorders</i>	Constipation, flatulence, vomiting, loose stools, dry mouth
<i>General disorders and administration site conditions</i>	Thirst, fatigue, malaise, pain, rigors, asthenia, fever
<i>Infections and infestations</i>	Pharyngitis, herpes simplex
<i>Metabolism and nutrition disorders</i>	Anorexia
<i>Musculoskeletal and connective tissue disorders</i>	Back pain, myalgia
<i>Nervous system disorders</i>	Dizziness, vertigo, hyperkinesia, hypertonia, taste perversion, visual field defect
<i>Psychiatric disorders</i>	Insomnia, nervousness
<i>Renal and urinary disorders</i>	Polyuria, renal pain
<i>Reproductive system and breast disorders</i>	Intermenstrual bleeding, dysmenorrhoea, leukorrhoea, menorrhagia, uterine spasm, vaginal disorder, female sexual dysfunction
<i>Skin and subcutaneous tissues disorders</i>	Pruritus, genital pruritus, rash, erythematous rash, dry skin, abnormal skin odour, urticaria
<i>Vascular disorders</i>	Flushing, hot flushes
Rare ($\geq 0.01\%$ and $< 0.1\%$)	
<i>Hepatobiliary disorders</i>	Hepatic toxicity, including rare cases of fatalities. Hepatic failure, hepatocellular necrosis, hepatitis, hepatocellular damage
<i>Cardiac disorders</i>	Torsade de pointes. QT prolongation

Patients treated with 150 mg weekly in dermal therapeutic studies

Common ($\geq 1\%$ and $< 10\%$)	
<i>Gastrointestinal disorders</i>	Abdominal pain, dyspepsia
<i>Nervous system disorders</i>	Headache
<i>Skin and subcutaneous tissue disorders</i>	Acne
Uncommon ($\geq 0.1\%$ and $< 1\%$)	
<i>Investigations</i>	Elevation of transaminase $> 2-3$ x upper limit of normal
<i>Nervous system disorders</i>	Paraesthesia
<i>Psychiatric disorders</i>	Insomnia, somnolence
<i>Skin and subcutaneous tissues disorders</i>	Pruritus, urticaria, increased sweating, drug eruption (including fixed drug eruption)

Paediatrics

In clinical studies, 562 children, from birth to 17 years, received doses from 1 to 12 mg/kg/day, for up to 129 days. The majority of patients (n=522) received 2 to 8 mg/kg/day for up to 97 days. Overall, approximately 10.3% experienced adverse events which were considered treatment related. The incidence of these adverse reactions and laboratory abnormalities do not suggest any marked difference between the paediatric population relative to the adult population. Based on this clinical trial data, the following adverse events were considered treatment related:

Common ($\geq 1\%$ and $< 10\%$)	
<i>Gastrointestinal disorders</i>	Vomiting, diarrhoea, abdominal pain
Uncommon ($\geq 0.1\%$ and $< 1\%$)	
<i>Cardiac disorders</i>	Cardiomyopathy
<i>Ear and labyrinth disorders</i>	Deafness
<i>Gastrointestinal disorders</i>	Nausea, dyspepsia, ileus, stomatitis, loose stools
<i>Hepatobiliary disorders</i>	Hepatocellular damage, jaundice
<i>Infections and infestations</i>	Infection
<i>Metabolism and nutrition disorders</i>	Anorexia
<i>Nervous system disorders</i>	Headache, taste perversion
<i>Respiratory, thoracic and mediastinal disorders</i>	Hypoxia, respiratory disorder
<i>Skin and subcutaneous tissue disorders</i>	Rash (erythematous & maculo-papular), pruritus, purpura
<i>Vascular disorders</i>	Hypertension

Post-marketing experience

In addition, the following adverse events have occurred during post-marketing:

<i>Cardiac disorders</i>	Torsade de pointes (see section 4.3 Contraindications)
<i>Gastrointestinal disorders</i>	Dyspepsia, vomiting
<i>Hepatobiliary disorders</i>	Hepatocellular necrosis
<i>Immune system disorders</i>	Anaphylaxis (including face oedema, angioedema and pruritus)
<i>Investigations</i>	QT prolongation (see section 4.3 Contraindications).
<i>Metabolism and nutrition disorders</i>	Hypercholesterolaemia, hypertriglyceridaemia and hypokalaemia
<i>Nervous system disorders</i>	Dizziness
<i>Skin and subcutaneous tissue disorders</i>	Drug reaction with eosinophilia and systemic symptoms (DRESS)

Reporting of suspected adverse reactions

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

4.9 Overdose

The minimal lethal human dose has been not established. There have been case reports of overdosage with Diflucan and in one case, a 42-year-old patient infected with human immunodeficiency virus developed hallucinations and exhibited paranoid behaviour after reportedly ingesting 8,200 mg of Diflucan. The patient was admitted to hospital, and his condition resolved within 48 hours.

Signs and symptoms are likely to be an extension of those under Section 4.8 Adverse effects.

There is no specific antidote. Treatment is symptomatic and supportive, including respiratory and cardiovascular function. Monitor for hypokalaemia and elevated liver enzymes; and obtain a full blood count to monitor for possible thrombocytopenia and agranulocytosis. Diflucan is largely excreted in the urine; forced volume diuresis would probably increase the elimination rate. A three hour haemodialysis session decreases plasma levels by approximately 50%.

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

5. PHARMACOLOGICAL PROPERTIES

5.1 Pharmacodynamics properties

Pharmacotherapeutic group: Antimycotics for systemic use, triazole derivatives, ATC code: J02AC01.

Mechanism of action

Diflucan, a member of a new class of triazole antifungal agents, is a potent and specific inhibitor of fungal sterol synthesis.

Diflucan, both orally and intravenously administered, is active in a variety of animal fungal infection models. Activity has been demonstrated against opportunistic mycoses, such as infections with *Candida* spp, including systemic candidiasis and in immunocompromised animals; with *Cryptococcus neoformans*, including intracranial infections, with *Microsporium* spp; and with *Trichophyton* spp. Diflucan has also been shown to be active in animal models of endemic mycoses, including infections with *Blastomyces dermatitidis*; with *Coccidioides immitis*, including intracranial infection; and with *Histoplasma capsulatum* in normal and immunosuppressed animals. Concurrent administration of fluconazole and amphotericin B in infected normal and immunocompromised mice showed antagonism of the two drugs in systemic infection with *Aspergillus fumigatus*. The clinical significance of results obtained in these studies is unknown.

Fluconazole is a highly selective inhibitor of fungal cytochrome P-450 sterol C-14 alpha demethylation. Mammalian cell demethylation is much less sensitive to fluconazole inhibition. The subsequent loss of normal sterols correlates with the accumulation of 14 alpha-methyl sterols in fungi and may be responsible for the fungistatic activity of fluconazole. Fluconazole 50 mg daily given up to 28 days has been shown not to affect corticosteroid levels or adrenocorticotrophic hormone (ACTH) stimulated response in healthy female volunteers. Plasma estradiol levels and urinary free cortisol levels were decreased with little effect on plasma testosterone levels. Interaction studies with antipyrine indicate that single or multiple doses of fluconazole 50 mg do not affect its metabolism.

Susceptibility *in vitro*

In vitro, fluconazole displays antifungal activity against clinically common *Candida* species (including *C. albicans*, *C. parapsilosis*, *C. tropicalis*). *C. glabrata* shows reduced susceptibility (I) to fluconazole while *C. krusei* is intrinsically resistant to fluconazole. The MICs and epidemiological cut-off value (ECOFF) of fluconazole for *C. guilliermondii* are higher than for *C. albicans*. The recently emerging species *C. auris* tends to be relatively resistant to fluconazole.

Fluconazole also exhibits activity *in vitro* against *Cryptococcus neoformans* and *Cryptococcus gattii* as well as the endemic moulds *Blastomyces dermatitidis*, *Coccidioides immitis*, *Histoplasma capsulatum* and *Paracoccidioides brasiliensis*.

Pharmacokinetic/pharmacodynamic relationship

In animal studies, there is a correlation between minimum inhibitory concentration (MIC) values and efficacy against experimental mycoses due to *Candida* spp. In clinical studies, there is an almost 1:1 linear relationship between the AUC and the dose of fluconazole. There is also a direct though imperfect relationship between the AUC or dose and a successful clinical response of oral candidosis and to a lesser extent candidaemia to treatment. Similarly cure is less likely for infections caused by strains with a higher fluconazole MIC.

Mechanisms of resistance

Candida spp have developed a number of resistance mechanisms to azole antifungal agents. Fungal strains which have developed one or more of these resistance mechanisms are known to exhibit high minimum inhibitory concentrations (MICs) to fluconazole which impacts adversely efficacy *in vivo* and clinically.

In usually susceptible species of *Candida*, the most commonly encountered mechanism of resistance development involves the target enzymes of the azoles, which are responsible for the biosynthesis of ergosterol. Resistance may be caused by mutation, increased production of an enzyme, drug efflux mechanisms, or the development of compensatory pathways.

There have been reports of superinfection with *Candida* species other than *C. albicans*, which often have reduced susceptibility (*C. glabrata*) or resistance to fluconazole (e.g., *C. krusei*, *C. auris*). Such infections may require alternative antifungal therapy. The resistance mechanisms have not been completely elucidated in some intrinsically resistant (*C. krusei*) or emerging (*C. auris*) species of *Candida*.

Susceptibility testing breakpoints

Susceptibility testing interpretation according to the European Committee on Antimicrobial Susceptibility Testing (EUCAST), Antifungal agents is recommended (<https://www.eucast.org/>).

5.2 Pharmacokinetic properties

The pharmacokinetic properties of Diflucan are similar following administration by the intravenous or oral route.

Absorption

After oral administration Diflucan is well absorbed, and plasma levels (and systemic bioavailability) are over 90% of the levels achieved after intravenous administration. Oral absorption is not affected by concomitant food intake. Peak plasma concentrations in the fasting state occur between 0.5 and 1.5 hours post dose with a plasma elimination half-life of approximately 30 hours. Plasma concentrations are proportional to dose. Ninety percent steady state levels are reached by day 4-5 with multiple once daily dosing.

Administration of a loading dose (on day 1) of twice the usual daily dose enables plasma levels to approximate to 90% steady state level by day 2.

Distribution

The apparent volume of distribution approximates to total body water. Plasma protein binding is low (11-12%).

Diflucan achieves good penetration into all body fluids studied. See table below.

Tissue or Fluid	Tissue (Fluid) : Plasma Concentration*
Cerebrospinal fluid ⁺	0.5 - 0.9
Saliva	1
Sputum	1
Blister fluid	1
Urine	10
Normal skin	10
Blister skin	2

* Relative to concurrent concentrations in plasma in subjects with normal renal function

+ Independent of degree of meningeal inflammation

Biotransformation

Fluconazole is metabolised only to a minor extent. About 11% of the dose is excreted in the urine as metabolites.

Elimination

The major route of excretion is renal with approximately 80% of the administered dose appearing in the urine as unchanged drug. Diflucan clearance is proportional to creatinine clearance. There is no evidence of circulating metabolites. The pharmacokinetics of fluconazole are markedly affected by reduction in renal function. There is an inverse relationship between the elimination half-life and creatinine clearance. The dose of Diflucan may need to be reduced in patients with impaired renal function (see section 4.2 Dose and method of administration). A 3-hour haemodialysis session reduces plasma concentration by about 50%.

The long plasma elimination half-life provides the basis for single dose therapy for vaginal candidiasis, once daily and once weekly dosing in the treatment of all other indicated fungal infections.

Special population

Paediatrics

There are differences in the pharmacokinetics of fluconazole between adults and children, with children after the neonatal period, generally having a faster elimination rate and larger volume of distribution than adults. These differences result in less accumulation on multiple dosing in children, with steady state achieved faster than in adults. Neonates have reduced elimination rates relative to adults and even higher volumes of distribution in comparison with older children. During the first 2 weeks after birth, the clearance of fluconazole increases (and the half-life is decreased) as renal function develops. The half-life obtained in infants was consistent with that found in older children, although the volume of distribution was higher. During the first year of life, the pharmacokinetics of fluconazole are similar to older children. No marked sex-related differences in pharmacokinetics are evident in children.

In children, the following mean pharmacokinetic data have been reported:

Age	Dose (mg/kg)	Clearance (mL/min/kg)	Half-life (Hours)	C _{max} (µg/mL)	V _{dss} (L/kg)
9months-13yrs Single oral:					
	2mg/kg	0.40	25.0	2.9	-
	8mg/kg	0.51	19.5	9.8	-
5yrs-15yrs Multiple I.V.					
	2mg/kg	0.49	17.4	5.5	0.722
	4mg/kg	0.59	15.2	11.4	0.729
	8mg/kg	0.66	17.6	14.1	1.069

Clearance corrected for body weight was not affected by age in these studies. Mean body clearance in adults is reported to be 0.23 mL/min/kg.

In premature newborns (gestational age 26 to 29 weeks), the mean clearance within 36 hours of birth was 0.180 mL/min/kg, which increased with time to a mean of 0.218 mL/min/kg 6 days later and 0.333 mL/min/kg 12 days later. Similarly, the half-life was 73.6 hours, which decreased with time to a mean of 53.2 hours 6 days later and 46.6 hours 12 days later.

5.3 Preclinical safety data

Carcinogenicity

Fluconazole showed no evidence of carcinogenic potential in mice and rats treated orally for 24 months at doses of 2.5 mg/kg/day, 5 mg/kg/day or 10 mg/kg/day (approximately 2-7 x recommended human dose). Male rats treated with 5 mg/kg/day and 10 mg/kg/day had an increased incidence of hepatocellular adenomas.

Genotoxicity

Fluconazole, with or without metabolic activation, was negative in tests for mutagenicity in 4 strains of *Salmonella typhimurium* and in the mouse lymphoma system. Cytogenetic studies *in vivo* and *in vitro* showed no evidence of chromosomal mutations.

6. PHARMACEUTICAL PARTICULARS

6.1 List of excipients

Powder for oral suspension

Sucrose, colloidal anhydrous silica, xanthan gum, sodium citrate dihydrate, citric acid, sodium benzoate, titanium dioxide (E171), natural orange flavour.

Capsules

Capsule content: Lactose monohydrate, maize starch, colloidal anhydrous silica, magnesium stearate, sodium lauryl sulfate.

Capsule shell composition: Gelatin, (E441), titanium dioxide (E171), (50, 100 and 150 mg capsules only), patent blue V (E131), (50, 100 and 150 mg capsules only), erythrosine (100 and 200 mg capsules only) and indigo carmine (200 mg capsules only).

Solution for infusion

Sodium chloride and water for injections.

6.2 Incompatibilities

This medicinal product must not be mixed with other medicinal products except those mentioned in Section 4.2 Method of administration.

6.3 Shelf life

Powder for oral suspension

36 months. The shelf life of the reconstituted suspension is 14 days.

Capsules

60 months.

Solution for infusion

60 months.

Once opened the product should be used immediately. Any unused infusion should be discarded.

From a microbiological point of view, the dilutions should be used immediately. If not used immediately, in-use storage times and conditions prior to use are the responsibility of the user.

6.4 Special precautions for storage

Store below 30°C.

6.5 Nature and contents of container

Powder for oral suspension

A 35 mL high density polyethylene (HDPE) bottle containing 50 mg/5 mL or 200 mg/5 mL of orange flavoured suspension when reconstituted.

Capsules

Blister packs of 50 mg, 100 mg and 200 mg of 28 capsules and blister packs of 150 mg of 1 capsule.

Solution for infusion

Pack of 1 clear type I glass vial sealed closed with rubber stoppers and aluminium caps. containing 100 mg/50 mL (2 mg/mL) infusion solution.

*Not all pack sizes or presentations are marketed.

6.6 Special precautions for disposal and other handling

Any unused medicine or waste material should be disposed of in accordance with local requirements.

7. MEDICINE SCHEDULE

S4, Prescription Medicine.

8. SPONSOR

Pfizer New Zealand Limited
PO Box 3998
Auckland, New Zealand, 1140.

Toll Free Number: 0800 736 363.

9. DATE OF FIRST APPROVAL

Diflucan[®] 10 mg/mL and 40mg/mL powder for oral suspension: 24 May 2001.

Diflucan[®] 50 mg and 150 mg capsules: 27 April 1990.

Diflucan[®] 100 mg and 200 mg capsules: 23 August 1990.

Diflucan[®] 2 mg/mL solution for infusion: 23 August 1990.

10. DATE OF REVISION OF THE TEXT

17 December 2021

[®] Registered trademark

Summary table of changes

Section changed	Summary of new information
4.6	Updates to this section in line with EU PRAC recommendations.