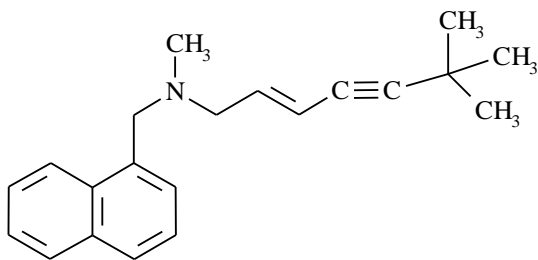


# LAMISIL<sup>®</sup> TABLETS

## terbinafine hydrochloride

### NAME OF THE MEDICINE

Active ingredient:	terbinafine hydrochloride
Chemical name:	(E)-N-(6,6-dimethyl-2-hepten-4-ynyl)-N-methyl-1-naphthalenemethanamine hydrochloride
CAS number:	78628-80-5
Molecular formula:	C <sub>21</sub> H <sub>26</sub> ClN
Molecular weight:	327.90
Chemical structure:	



• HCl

### DESCRIPTION

Terbinafine hydrochloride is a white to off-white, finely crystalline powder. It is soluble in isopropyl alcohol (> 70 mg/mL at 25°C) and ethanol (> 70 mg/mL at 25°C), and slightly soluble in water (6.3 mg/mL at 25°C). Each Lamisil tablet contains terbinafine hydrochloride equal to either 125 mg or 250 mg terbinafine base. Each tablet also contains magnesium stearate, hypromellose, sodium starch glycolate, and cellulose - microcrystalline. Lamisil 250 mg tablets also contain silica-colloidal anhydrous. Lamisil 125 mg tablets also contain lactose.

### PHARMACOLOGY

#### Pharmacodynamics

Pharmacotherapeutic group: Oral antifungal agent, ATC Code: D01B A02

Terbinafine is an allylamine with antifungal activity mainly against dermatophytes, including *Trichophyton* (e.g. *T. rubrum*, *T. mentagrophytes*, *T. verrucosum*, *T. violaceum*), *Microsporum canis*, and *Epidermophyton floccosum*.

**Mechanism of Action:**

Terbinafine interferes specifically with fungal sterol biosynthesis at an early step. This leads to a deficiency in ergosterol and to an intracellular accumulation of squalene, resulting in fungal cell death. Terbinafine acts by inhibition of squalene epoxidase in the fungal cell membrane. The enzyme squalene epoxidase is not linked to the cytochrome P450 system. When given orally, the drug concentrates in skin and nails at levels associated with antifungal activity.

**Pharmacokinetics****Absorption:**

Following oral administration, terbinafine is well absorbed (>70%) and the bioavailability of terbinafine hydrochloride from Lamisil tablets as a result of first-pass metabolism is approximately 40%. A single oral dose of 250 mg terbinafine results in peak plasma concentration ( $C_{max}$ ) of 0.83 microgram/mL within two hours of administration. The absorption half-life is 0.8 hours and the distribution half-life is 4.6 hours.

An increase in the AUC of terbinafine of less than 20% is observed when Lamisil tablets are administered with food. At steady-state, in comparison to a single dose, peak concentration of terbinafine is 25% higher and plasma AUC increases by a factor of 2.5. The increase in plasma AUC is consistent with an effective half-life of ~36 hours.

**Distribution:**

Terbinafine binds strongly to plasma proteins (99%). It concentrates in the lipophilic stratum corneum. Terbinafine is also secreted in sebum, thus achieving high concentrations in hair follicles, hair and sebum-rich skins. There is also evidence from animal studies that terbinafine is distributed into the nail plate in the first few weeks after commencing therapy.

Animal studies also indicate that terbinafine accumulates in all lipophilic tissues, including the retinal and choroid tissues. In studies conducted so far, no ophthalmological abnormalities attributable to Lamisil tablets have been reported in humans.

**Metabolism:**

Terbinafine is extensively metabolised in the body. Biotransformation results in metabolites with no antifungal activity.

**Elimination:**

Terbinafine and its metabolites are excreted predominantly in the urine. No age-dependent changes in pharmacokinetics have been observed. In patients with renal impairment (creatinine clearance  $\leq 50$  mL/min) or with pre-existing liver disease, the clearance of terbinafine is decreased by approximately 50% compared to normal volunteers.

**INDICATIONS**

- Treatment in adults of ringworm (*tinea corporis*, *tinea cruris* and *tinea pedis*) due to infection caused by dermatophytes such as Trichophyton (e.g. *T. rubrum*, *T. mentagrophytes*, *T. verrucosum*, *T. violaceum*), *Microsporum canis* and *Epidermophyton floccosum*, where oral therapy is considered appropriate owing to the site, severity or extent of the infection, and the infection is not responsive to topical therapy.
- Onychomycosis in adults (fungal infection of the nail) caused by dermatophyte fungi.

## **CONTRAINDICATIONS**

- Hypersensitivity to terbinafine or to any of the excipients in the formulation.
- Severe, chronic, or active hepatic disease (see "PRECAUTIONS").

## **PRECAUTIONS**

### **Use in Patients with Hepatic Impairment**

Lamisil tablets are contraindicated for patients with chronic or active hepatic disease. Before prescribing Lamisil tablets, liver function tests should be performed since hepatotoxicity may occur in patients with and without pre-existing liver disease. Therefore periodic monitoring (after 4-6 weeks of treatment) of liver function tests is recommended. Lamisil should be immediately discontinued in case of elevation of liver function tests. Very rare cases of liver failure (some leading to liver transplant or death) have been reported with the use of Lamisil tablets. In the majority of hepatic failure cases, the patients had underlying systemic conditions (see "ADVERSE EFFECTS"). Patients prescribed Lamisil tablets should be warned to report immediately any symptoms of persistent nausea, anorexia, fatigue, vomiting, right upper abdominal pain or jaundice, dark urine or pale stools. Patients with these symptoms should discontinue taking oral terbinafine and the patient's hepatic function should be immediately evaluated.

### **Use in Patients with Renal Impairment**

The use of Lamisil tablets in patients with impaired renal function (creatinine clearance less than 50 mL/min or serum creatinine of more than 300 micromol/L) has not been adequately studied and therefore is not recommended.

### **Effect on vision**

During high-dose studies in monkeys, refractile irregularities were observed in the retina at doses that were 30 to 60 times the human dose (non-toxic effect level 50 mg/kg). The clinical relevance of this observation is unknown. However, the ocular effects in monkeys were not confirmed in humans in the placebo-controlled trials, where the incidence of ophthalmic abnormalities was lower in the Lamisil tablet-treated patients (1.1%) compared with those who received placebo (1.5%).

**Transient decreases in absolute lymphocyte counts (ALC)**

Transient decreases in absolute lymphocyte counts (ALC) have been observed in controlled clinical trials. In placebo-controlled trials, 8/465 Lamisil tablet-treated patients (1.7%) and 3/137 placebo-treated patients (2.2%) had decreases in ALC to below 1000/mm<sup>3</sup> on two or more occasions. The clinical significance of this observation is unknown. However, in patients with known or suspected immunodeficiency, physicians should consider monitoring complete blood counts in individuals using Lamisil tablet therapy for greater than six weeks.

**Effect on blood**

Patients taking Lamisil tablets are at risk of developing agranulocytosis, thrombocytopenia, pancytopenia and neutropenia, which are very rarely associated with terbinafine. The problem usually resolves within a few days to a week of withdrawal of Lamisil tablets. Patients taking Lamisil tablets should be advised to report symptoms of infections. Prescribers should examine the patient to determine the correct aetiology of any blood dyscrasias that occur in patients treated with Lamisil tablets, and consideration should be given to a possible change in medication regimen, including discontinuation of treatment with Lamisil tablets.

**Effect on lipids**

In chronic toxicity studies in rats, oral terbinafine, at a dose of 309 mg/kg per day, increased serum cholesterol levels. This effect was more marked in female, than in male, rats. Effects on triglycerides levels were not consistent among the various studies. In monkeys a daily dose of 300 mg/kg increased triglyceride levels and chylomicron concentrations. In a small clinical study, a daily dose of 250 mg for 8 weeks did not result in detectable changes in the plasma lipid profile. In other clinical trials there was no evidence of a significant change in the plasma lipid profile of patients.

**Dermatological Effects**

Serious skin reactions (e.g. Stevens-Johnson syndrome, toxic epidermal necrolysis, drug rash with eosinophilia and systemic symptoms) have been very rarely reported in patients taking Lamisil tablets. If progressive skin rash occurs, Lamisil tablet treatment should be discontinued.

Terbinafine should be used with caution in patients with pre-existing psoriasis or lupus erythematosus as precipitation and exacerbation of psoriasis and cutaneous and systemic lupus erythematosus have been reported in a postmarketing setting.

**Carcinogenicity**

In a 2 year rat carcinogenicity study, small but significant increases in hepatocellular carcinomas, adenomas and combined tumours were seen in males at a dietary dose of 69 mg/kg per day. No increase in hepatic tumours was seen in female rats at a dietary dose of 97 mg/kg per day.

**Use in Pregnancy (Category B1)**

Foetal toxicity and fertility studies in animals suggest no adverse effects.

Since clinical experience in pregnant women is not available, Lamisil tablets should not be used during pregnancy unless the potential benefits outweigh any potential risks.

**Use in Lactation**

Terbinafine is excreted in breast milk. Therefore, mothers receiving oral treatment with Lamisil tablets should not breast-feed.

**Use in the Elderly**

There is no evidence to suggest that elderly patients require different dosages or experience side effects different from those in younger patients. When using Lamisil tablets in this age group, the possibility of impairment of liver or kidney function should be considered (see "PRECAUTIONS").

**Use in Children**

There is no experience with terbinafine in children and its use cannot be recommended. Lamisil tablets should be kept out of reach of children.

**INTERACTIONS WITH OTHER MEDICINES**

The plasma clearance of terbinafine may be accelerated by drugs, which induce metabolism and may be inhibited by drugs, which inhibit cytochrome P450. Where co-administration of such agents is necessary, the dosage of Lamisil tablets may need to be adjusted accordingly.

There have been spontaneous reports of increase or decrease in prothrombin time in patients taking oral terbinafine and warfarin concomitantly. However, a causal relationship between Lamisil tablets and these changes has not been established.

Cautious use of Lamisil tablets is advised in women taking oral contraceptives since a few cases of menstrual disorders have been reported in patients taking this drug combination, although the incidence of these disorders remains within the background incidence of patients taking oral contraceptives alone.

***The following medicinal products may increase the effect or plasma concentration of terbinafine***

Cimetidine decreased the clearance of terbinafine by 33 %.

Fluconazole significantly increased the  $C_{max}$  and AUC of terbinafine, due to inhibition of both CYP2C9 and CYP3A4 enzymes. Similar increase in exposure may occur when other drugs which inhibit both CYP2C9 and CYP3A4, such as ketoconazole and amiodarone, are concomitantly administered with terbinafine.

***The following medicinal products may decrease the effect or plasma concentration of terbinafine***

Rifampicin increased the clearance of terbinafine by 100 %.

***Effect of terbinafine on other medicinal products***

*In vitro* and *in vivo* studies showed negligible potential for interaction with the drugs that are metabolised via the CYP450 system except those with CYP2D6-mediated metabolism (see below).

Terbinafine does not interfere with the clearance of antipyrine or digoxin. Terbinafine clearance is unaffected by cyclosporin.

There was no effect of terbinafine on the pharmacokinetics of fluconazole. Further there was no clinically relevant interaction between terbinafine and the potential comedications cotrimoxazole (trimethoprim and sulfamethoxazole), zidovudine or theophylline.

***Terbinafine may increase the effect or plasma concentration of the following medicinal products***

***Compounds predominantly metabolised by CYP2D6***

Terbinafine inhibits the CYP2D6-mediated metabolism, therefore patients receiving concomitant treatment with drugs predominantly metabolised by this enzyme, such as tricyclic antidepressants (TCAs; e.g. desipramine), beta-blockers, selective serotonin reuptake inhibitors (SSRIs), antiarrhythmics Class 1A, 1B, and IC, and monoamine oxidase inhibitors (MAOIs) Type B, should be followed, especially if the co-administered drug has a narrow therapeutic window.

In studies in healthy subjects characterized as extensive metabolisers of dextromethorphan (antitussive drug and CYP2D6 probe substrate), terbinafine significantly increased the dextromethorphan/dextrorphan metabolic ratio in urine. Thus, terbinafine may convert extensive CYP2D6 metabolisers to poor metaboliser status.

Caffeine - Terbinafine decreased the clearance of caffeine administered intravenously by 19 %.

***Terbinafine may decrease the effect or plasma concentration of the following medicinal products***

Cyclosporin - Terbinafine increased the clearance of cyclosporin by 15 %.

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

No studies on the effects of Lamisil tablets treatment on the ability to drive and use machines have been performed. Patients who experience dizziness as an undesirable effect should avoid driving vehicles or using machines.

### **ADVERSE EFFECTS**

In general Lamisil tablets are well tolerated. In clinical trials, adverse events occurred in 10.4% of patients taking terbinafine tablets and 5.6% of patients taking placebo. Most adverse events were mild to moderate in severity and of a short duration.

Adverse drug reactions from clinical trials experience are listed by MedDRA system organ class. Within each system organ class, the adverse drug reactions are ranked under heading by frequency, with the most frequent reactions first. The frequency category for each adverse drug reaction is based on the following convention (CIOMS III): very common ( $\geq 1/10$ ); common ( $\geq 1/100$  to,  $< 1/10$ ); uncommon ( $\geq 1/1,000$  to,  $< 1/100$ ); rare ( $\geq 1/10,000$  to,  $< 1/1,000$ ); very rare ( $< 1/10,000$ ).

#### **Gastrointestinal disorders:**

Very common:           nausea, vomiting, flatulence, mild abdominal discomfort, abdominal cramps, anorexia, diarrhoea, dyspepsia/gastritis, belching, abdominal distension, decreased appetite

#### **Immune system disorders:**

Very rare:                anaphylactoid reactions (including angioedema), cutaneous and systemic lupus erythematosus

#### **Psychiatric disorders**

Common:                depression  
Uncommon:             anxiety

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

Very common:         urticaria, rash  
Common:                pruritus, erythema  
Uncommon:             photosensitivity reactions  
Very rare:               psoriaform eruptions or exacerbation of psoriasis, Stevens-Johnson syndrome, toxic epidermal necrolysis, erythema multiforme, acute generalised exanthematous pustulosis, toxic skin eruption, dermatitis exfoliative, dermatitis bullous, alopecia. In the event of an allergic or severe skin reaction, Lamisil tablet treatment should be discontinued.

**Musculoskeletal and connective tissue disorders:**

Very common: musculoskeletal reactions (arthralgia, myalgia)

**Hepatobiliary disorders:**

Rare: transient increases in liver enzymes, hepatobiliary dysfunction, cholestatic jaundice, liver failure (some leading to liver transplant or death). In the majority of liver failure cases, the patients had underlying systemic conditions (see “CONTRAINDICATIONS”).

**Blood and lymphatic system disorders:**

Uncommon: anemia

Very rare: haematological disorders such as neutropenia, agranulocytosis, pancytopenia and thrombocytopenia

**Nervous system disorders:**

Very common: headache

Common: dysgeusia\* including ageusia\*, dizziness, tiredness/fatigue

Uncommon: paraesthesia and hypoaesthesia

Very rare: sedation, light-headedness, chest pain.

**Eye disorders:**

**Common: visual impairment**

**Ear and labyrinth disorders:**

**Uncommon: tinnitus**

**General disorders:**

Uncommon: pyrexia

**Investigations:**

Uncommon: weight decreased\*\*

**Effect on laboratory tests:**

Transient increases in serum urea, serum creatinine, and liver enzymes.

Transient decreases in haematocrit, haemoglobin, and leucocytes.

\* Hypogeusia, including ageusia, which usually recover within several weeks after discontinuation of the drug. Isolated cases of prolonged hypogeusia have been reported.

\*\* Weight decreased secondary to dysgeusia.

**Other adverse drug reactions from post-marketing spontaneous reports**

The following adverse drug reactions have been derived from post-marketing experience with Lamisil via spontaneous case reports and literature cases. Because these reactions are reported voluntarily from a population of uncertain size, it is not possible to reliably estimate



their frequency which is therefore categorized as not known. Adverse drug reactions are listed according to system organ classes in MedDRA.

**Immune system disorders:** anaphylactic reaction, serum sickness-like reaction

**Psychiatric disorders:** anxiety and depressive symptoms secondary to taste disturbances

**Ear and labyrinth disorders:** hypoacusis, impaired hearing

**Eye disorders:** vision blurred, visual acuity reduced

**Vascular disorders:** vasculitis

**Nervous system disorders:** anosmia including permanent anosmia, hyposmia

**Skin and subcutaneous tissue disorders:** drug rash with eosinophilia and systemic symptoms

**Gastrointestinal disorders:** pancreatitis

**Musculoskeletal and connective tissue disorders:** rhabdomyolysis

**General disorders and administration site conditions:** influenza-like illness

**Investigations:** blood creatine phosphokinase increased.

## **DOSAGE AND ADMINISTRATION**

### **Recommended Dosages and intervals**

#### **Adults**

*Skin infections:* 250 mg once a day

*Onychomycosis:* 250 mg once a day

#### **Administration**

Lamisil tablets should be taken orally. The bioavailability of terbinafine is not affected by a light meal.

#### **Duration of Treatment**

The duration of treatment varies according to the indication and the severity of the infection.

*Skin Infections:*

**Likely durations of treatment are as follows:**

- Tinea pedis (interdigital, plantar/moccasin type): 2 to 6 weeks
- Tinea corporis, cruris: 2 to 4 weeks

Complete resolution of the signs and symptoms of infection may not occur until several weeks after mycological cure.

*Onychomycosis:*

For most patients the duration for successful treatment is between six weeks and three months.

Infections of finger and toenails (other than big toe) usually respond to the shorter duration of treatment, particularly in patients of younger age with a normal rate of nail outgrowth. In patients with slow nail growth, treatment for up to three months is usually adequate. However, infections in the big toe, or if nail growth is very poor, treatment for up to 6 months may be necessary.

Optimal clinical effect is seen some months after mycological cure and cessation of treatment. This is related to the period required for outgrowth of healthy nail tissue.

## **OVERDOSAGE**

A few cases of overdosage (up to 5 g) have been reported.

### **Signs and Symptoms:**

Studies in animals suggest that in a high dose situation, such as accidental overdose, central nervous symptoms (CNS) may appear. The relevance of those effects to man is unknown. However, these effects can be monitored.

**Central Nervous System:** headache and dizziness

**Gastrointestinal system:** nausea, and epigastric pain

### **Treatment:**

Telephone the Poisons Information Centre on 131 126 for advice on the management of an overdose.

The recommended treatment of overdosage consists in eliminating the drug, primarily by the administration of activated charcoal, and giving symptomatic supportive therapy, if needed. Activated charcoal may reduce absorption of the drug if given within one or two hours after ingestion. In patients who are not fully conscious or have impaired gag reflex, consideration should be given to administering activated charcoal via a nasogastric tube, once the airway is protected.

## **PRESENTATION AND STORAGE CONDITIONS**

### **Presentation**

250 mg terbinafine, as the hydrochloride (11 mm, white to yellow-tinged, circular, biconvex, bevelled edges, scored on one side and coded "LAMISIL 250" (circular) on the other side) in blister packs of 42, 14 (not supplied), and 28 (not supplied) .

125 mg terbinafine, as the hydrochloride (9 mm, white to white-tinged yellow, circular, biconvex, bevelled edges, scored and coded LP on one side) in blister packs of 28 (not supplied).

**Storage Conditions**

Store below 30°C. Protect from light. Keep out of reach of children.

**NAME AND ADDRESS OF THE SPONSOR**

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**POISON SCHEDULE OF THE MEDICINE**

(S4) Prescription Only Medicine

**DATE OF FIRST INCLUSION IN THE AUSTRALIAN REGISTER OF THERAPEUTIC GOODS**

22 December 2003

**DATE OF MOST RECENT AMENDMENT**

18 January 2018

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