

# New Zealand Data Sheet



## 1. PRODUCT NAME

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Silvasta® 25 mg film-coated tablets  
Silvasta® 50 mg film-coated tablets  
Silvasta® 100 mg film-coated tablets

## 2. QUALITATIVE AND QUANTITATIVE COMPOSITION

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Each Silvasta 25 mg tablet contains 35.12 mg of sildenafil citrate (equivalent to 25 mg sildenafil).  
Each Silvasta 50 mg tablet contains 70.24 mg of sildenafil citrate (equivalent to 50 mg sildenafil).  
Each Silvasta 100 mg tablet contains 140.48 mg of sildenafil citrate (equivalent to 100 mg sildenafil).

### **Excipient(s) with known effect**

Silvasta 25 mg, 50 mg and 100 mg tablets contain lactose monohydrate.  
For the full list of excipients, see section 6.1.

## 3. PHARMACEUTICAL FORM

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Silvasta tablets are blue elliptical, biconvex, film-coated tablets.

**Silvasta 25 mg tablet** is marked "SL25" on one side.  
**Silvasta 50 mg tablet** is marked "SL50" on one side.  
**Silvasta 100 mg tablet** is marked "SL100" on one side.

Do not halve tablet. Dose equivalence when the tablet is divided has not been established.

## 4. CLINICAL PARTICULARS

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### **4.1. Therapeutic indications**

Sildenafil is indicated for the treatment of erectile dysfunction in adult males.

### **4.2. Dose and method of administration**

#### **Dose**

##### ***Adults***

The recommended starting dose is 50 mg taken approximately one hour before sexual activity. Based on efficacy and toleration, the dose may be increased to 100 mg or decreased to 25 mg. The maximum recommended dose is 100 mg. The maximum recommended dosing frequency is

once per day. If sildenafil is taken with food, the onset of activity may be delayed compared to the fasted state (refer to section 5.2).

### ***Special populations***

#### **Elderly population**

Since sildenafil clearance is reduced in elderly patients, a first dose of 25 mg should be considered. Based on efficacy and toleration, the dose may be increased to 50 mg and 100 mg.

#### **Renal impairment**

The dosing recommendations for adults should be followed for patients with mild to moderate renal impairment (Clcr = 30–80 mL/min). Since sildenafil clearance is reduced in patients with severe renal impairment (Clcr <30 mL/min) a 25 mg starting dose should be considered. Based on efficacy and toleration, the dose may be increased to 50 mg and 100 mg.

#### **Hepatic impairment**

Since sildenafil clearance is reduced in patients with hepatic impairment (e.g. cirrhosis) a 25 mg starting dose should be considered. Based on efficacy and toleration, the dose may be increased to 50 mg and 100 mg.

#### **Patients using other medications**

Concomitant use of potent CYP 3A4 inhibitors has been associated with increased plasma levels of sildenafil (e.g. erythromycin, 182%, saquinavir, 210%). It can also be expected that more potent CYP 3A4 inhibitors such as ketoconazole and itraconazole would result in increased plasma levels of sildenafil (refer to section 4.5).

Since higher plasma levels may increase both the efficacy and incidence of adverse events, a starting dose of 25 mg should be considered in these patients. Given the extent of the interaction with patients receiving concomitant therapy with ritonavir, it is recommended not to exceed a maximum single dose of 25 mg of sildenafil in a 48-hour period (refer to section 4.5).

In order to minimise the potential for developing postural hypotension, patients should be stable on alpha-blocker therapy prior to initiating sildenafil treatment. In addition, initiation of sildenafil at lower doses should be considered (refer to section 4.4 and 4.5).

### ***Paediatric population***

Sildenafil is not indicated for use in children.

### **Method of Administration**

Oral administration.

### **4.3. Contraindications**

Use of sildenafil is contraindicated in patients with known hypersensitivity to any component of the tablet.

Sildenafil was shown to potentiate the hypotensive effects of acute and chronic nitrates, and its co-administration with nitric oxide donors, organic nitrates or organic nitrites in any form, either regularly or intermittently, is therefore contraindicated. Medicines which must not be used concomitantly include glyceryl trinitrate (injection, tablets, sprays or topical such as patches and ointments), isosorbide salts, sodium nitroprusside, amyl nitrite, nicorandil or organic nitrates in any form (refer to section 4.4).

The co-administration of PDE5 inhibitors, including sildenafil, with guanylate cyclase stimulators, such as riociguat, is contraindicated as it may potentially lead to symptomatic hypotension.

Sildenafil is contraindicated in men for whom sexual intercourse is inadvisable due to cardiovascular risk factors (e.g. patients with severe cardiovascular disease such as established cardiac failure and unstable angina pectoris) (refer to section 4.4).

The possibility of undiagnosed cardiovascular disorders in men with erectile dysfunction should be considered before prescribing sildenafil. Sildenafil is not recommended in patients with male erectile dysfunction with a previous episode of non-arteritic anterior ischaemic optic neuropathy (NAION) (refer to section 4.4 and 4.8).

The safety of sildenafil has not been studied in the following sub-groups of patients and its use is therefore contraindicated until further information is available: severe hepatic impairment, hypotension (blood pressure <90/50 mmHg), hypertension (blood pressure >170/110 mmHg), recent history of stroke or myocardial infarction and known hereditary degenerative retinal disorders such as retinitis pigmentosa (a minority of these patients have genetic disorders of retinal phosphodiesterases).

### **4.4. Special warnings and precautions for use**

A thorough medical history and physical examination should be undertaken to diagnose erectile dysfunction, determine potential underlying causes and identify appropriate treatment.

Prior to initiating any treatment for erectile dysfunction, physicians should consider the cardiovascular status of their patients, including those with recent onset angina, since there is a degree of cardiovascular risk associated with sexual intercourse. Sildenafil has vasodilator properties, resulting in mild and transient decreases in blood pressure and, as such, potentiates the hypotensive effect of nitrates (refer to section 4.3).

Physicians should advise patients to stop use of all PDE5 inhibitors, including sildenafil, and seek immediate medical attention in the event of a sudden loss of vision in one or both eyes. Such an event may be a sign of non-arteritic anterior ischemic optic neuropathy (NAION), a cause of decreased vision including permanent loss of vision, that has been reported rarely post-

marketing in temporal association with the use of all PDE-5 inhibitors. An observational study evaluating whether recent use of PDE5 inhibitors, as a class, was associated with acute onset of NAION suggests an increase in the risk of NAION with PDE5 inhibitor use. In case of sudden vision loss, patients should be advised to stop taking sildenafil and consult a physician immediately.

Physicians should also discuss with patients the increased risk of recurrence of NAION in individuals who have already experienced NAION in one eye. PDE5 inhibitors, including sildenafil, are not recommended in patients with male erectile dysfunction with a previous episode of NAION (refer to section 4.3 and 4.8).

After patients have taken sildenafil, it is unknown when nitrates, if necessary, can be safely administered (refer to section 4.3). Based on the pharmacokinetic profile of a single 100 mg oral dose given to healthy normal volunteers, the plasma levels of sildenafil at 24 hours post dose are approximately 2 ng/mL (compared to peak plasma levels of approximately 440 ng/mL). In the following patients: age > 65, hepatic impairment (e.g. cirrhosis), severe renal impairment (e.g. creatinine clearance <30 ml/min), and concomitant use of potent cytochrome P450 3A4 inhibitors (e.g. erythromycin), plasma levels of sildenafil at 24 hours post dose have been found to be 3 to 8 times higher than those seen in healthy volunteers. Although plasma levels of sildenafil at 24 hours post dose are much lower than at peak concentration, it is unknown whether nitrates can be safely co-administered at this time point.

In clinical trials, sildenafil has been shown to have systemic vasodilatory properties that result in transient decreases in blood pressure. This is of little or no consequence in most patients. However, prior to prescribing sildenafil, physicians should carefully consider whether their patients with certain underlying conditions could be adversely affected by such vasodilatory effects, especially in combination with sexual activity. Patients with increased susceptibility to vasodilators include those with left ventricular outflow obstruction (e.g., aortic stenosis, hypertrophic obstructive cardiomyopathy), or those with the rare syndrome of multiple system atrophy manifesting as severely impaired autonomic control of blood pressure.

Agents for the treatment of erectile dysfunction should be used with caution in patients with anatomical deformation of the penis (such as angulation, cavernosal fibrosis or Peyronie's disease), or in patients who have conditions which may predispose them to priapism (such as sickle cell anaemia, multiple myeloma or leukaemia).

The safety and efficacy of combinations of sildenafil with other PDE5 inhibitors, or other pulmonary arterial hypertension (PAH) treatments containing sildenafil or with other treatments of erectile dysfunction have not been studied. Therefore, the use of such combinations is not recommended.

Caution is advised when sildenafil is administered to patients taking an alpha-blocker, as the co-administration may lead to symptomatic hypotension in a few susceptible individuals (refer to section 4.5). In order to minimise the potential for developing postural hypotension, patients should be haemodynamically stable on alpha-blocker therapy prior to initiating sildenafil

treatment. Initiation of sildenafil at lower doses should be considered (refer to section 4.2). In addition, physicians should advise patients what to do in the event of postural hypotensive symptoms.

Sildenafil has no effect on bleeding time, including during co-administration with aspirin. *In-vitro* studies with human platelets indicate that sildenafil potentiates the antiaggregatory effect of sodium nitroprusside (a nitric oxide donor). There is no safety information on the administration of sildenafil to patients with bleeding disorders or active peptic ulceration. Therefore, sildenafil should be administered with caution to these patients.

There are limited safety data in patients with diabetic retinopathy. Sudden decrease or loss of hearing has been reported in a small number of post-marketing and clinical trials cases with the use of all PDE5 inhibitors, including sildenafil. Most of these patients had risk factors for sudden decrease or loss of hearing. No causal relationship has been made between the use of PDE5 inhibitors and sudden decrease or loss of hearing. In case of sudden decrease or loss of hearing patients should be advised to stop taking sildenafil and consult a physician promptly.

The incidence of adverse events may be greater in those patients who require the maximum recommended dose of 100 mg (e.g. some diabetic and spinal cord injury patients).

Patients with cardiovascular disease who have not engaged in sexual intercourse for a number of years should have their cardiovascular status carefully assessed prior to initiating treatment with sildenafil.

Prolonged erections, greater than four hours and priapism (painful erections greater than 6 hours) have been reported infrequently since market approval of sildenafil. In the event of an erection that persists longer than 4 hours, the patient should seek immediate medical assistance. If priapism is not treated immediately, penile tissue damage and permanent loss of potency could result.

#### **4.5. Interaction with other medicines and other forms of interaction**

##### **Effect of other drugs on sildenafil**

Sildenafil metabolism is principally mediated by the cytochrome P450 (CYP) isoforms 3A4 (major route) and 2C9 (minor route). Therefore, inhibitors of these isoenzymes may reduce sildenafil clearance and inducers of these isoenzymes may increase sildenafil clearance.

Cimetidine (800 mg), a non-specific CYP3A4 inhibitor, caused a 56% increase in plasma sildenafil concentrations when co-administered with sildenafil (50 mg) to healthy volunteers.

When a single 100 mg dose of sildenafil was administered with erythromycin, a specific CYP3A4 inhibitor, at steady state (500 mg twice daily for 5 days), there was a 182% increase in sildenafil systemic exposure (AUC).

Co-administration of the HIV protease inhibitor saquinavir, also a CYP3A4 inhibitor, at steady state (1200 mg three times daily) with sildenafil (100 mg single dose) resulted in a 140% increase in sildenafil  $C_{max}$  and a 210% increase in sildenafil AUC (refer to section 4.2). Sildenafil had no effect on saquinavir pharmacokinetics. Stronger CYP3A4 inhibitors such as ketoconazole and itraconazole would be expected to have still greater effects.

Co-administration with the HIV protease inhibitor ritonavir, which is a highly potent P450 inhibitor, at steady state (500 mg twice daily) with sildenafil (100 mg single dose) resulted in a 300% (4-fold) increase in sildenafil  $C_{max}$  and a 1000% (11-fold) increase in sildenafil plasma AUC. At 24 hours, the plasma levels of sildenafil were still approximately 200 ng/mL, compared to approximately 5 ng/mL when sildenafil was dosed alone. This is consistent with ritonavir's marked effects on a broad range of P450 substrates. Sildenafil had no effect on ritonavir pharmacokinetics (refer to section 4.2).

Since systemic exposure to sildenafil increases on co-administration with inhibitors of CYP3A4, the sildenafil dose may have to be reduced depending on tolerability.

Single doses of antacid (magnesium hydroxide/aluminium hydroxide) did not affect the bioavailability of sildenafil.

There is no information on the interaction between sildenafil and cyclosporine. It can be expected that concomitant administration of CYP3A4 inducers, such as rifampicin, will decrease plasma levels of sildenafil.

Population pharmacokinetic analysis of clinical trial data indicated a reduction in sildenafil clearance when co-administered with CYP3A4 inhibitors (such as ketoconazole, erythromycin, cimetidine). However, there was no increased incidence of adverse events in these patients.

Population pharmacokinetic analysis showed no effect of concomitant medication on sildenafil pharmacokinetics when grouped as CYP2C9 inhibitors, CYP2D6 inhibitors (such as selective serotonin reuptake inhibitors, tricyclic antidepressants), thiazide and related diuretics, loop and potassium sparing diuretics, ACE inhibitors, calcium channel blockers, beta-adrenoreceptor antagonists or inducers of CYP450 metabolism (such as barbiturates).

In normal healthy male volunteers, there was no evidence of an effect of azithromycin (500 mg daily for 3 days) on the AUC,  $C_{max}$ ,  $T_{max}$ , elimination rate constant or subsequent half-life of sildenafil or its major circulating metabolite.

In a study of healthy male volunteers, co-administration of the endothelin antagonist, bosentan, (an inducer of CYP3A4 [moderate], CYP2C9 and possibly of CYP2C19) at steady state (125 mg twice a day) with sildenafil at steady state (80 mg three times a day) resulted in 62.6% and 55.4% decrease in sildenafil AUC and  $C_{max}$ , respectively. Sildenafil increased bosentan AUC and  $C_{max}$  by 49.8% and 42%, respectively.

## **Effects of sildenafil on other drugs**

Sildenafil is a weak inhibitor of the cytochrome P450 isoforms 1A2, 2C9, 2C19, 2D6, 2E1 and 3A4 (IC<sub>50</sub> > 150 micromolar). Given sildenafil peak plasma concentration of approximately 1 micromolar after recommended doses, it is unlikely that sildenafil will alter the clearance of substrates of these isoenzymes.

There are no data on the interaction of sildenafil and non-specific phosphodiesterase inhibitors such as theophylline or dipyridamole.

In three specific drug-drug interaction studies, the alpha-blocker doxazosin (4 mg and 8 mg) and sildenafil (25 mg, 50 mg, or 100 mg) were administered simultaneously to patients with benign prostatic hyperplasia (BPH) stabilized on doxazosin therapy. In these study populations, mean additional reductions of supine blood pressure of 7/7 mmHg, 9/5 mmHg, and 8/4 mmHg, and mean additional reductions of standing blood pressure of 6/6 mmHg, 11/4 mmHg, and 4/5 mmHg, respectively, were observed. When sildenafil and doxazosin were administered simultaneously to patients stabilized on doxazosin therapy, there were infrequent reports of patients who experienced symptomatic postural hypotension. These reports included dizziness and light-headedness, but not syncope. Concomitant administration of sildenafil to patients taking alpha-blocker therapy may lead to symptomatic hypotension in a few susceptible individuals (refer to section 4.2 and 4.4).

No significant interactions were shown when sildenafil 50 mg was co-administered with tolbutamide (250 mg) or warfarin (40 mg), both of which are metabolised by CYP2C9. Sildenafil (50 mg) did not potentiate the increase in bleeding time caused by aspirin (150 mg).

Sildenafil (100 mg) did not affect the steady state pharmacokinetics of the HIV protease inhibitors, saquinavir and ritonavir, both of which are CYP3A4 substrates (see section 4.5, effects of other medicines on sildenafil).

Sildenafil causes a small reduction in supine and tilted diastolic blood pressure (3.5 and 6.1mmHg respectively) in healthy subjects who had a blood alcohol level of 80 mg/dL.

No interaction was seen when sildenafil (100 mg) was co-administered with amlodipine in hypertensive patients. The mean additive reduction on supine blood pressure (systolic, 8 mmHg; diastolic 7 mmHg) was of a similar magnitude to that seen when sildenafil was administered alone to healthy volunteers (refer to section 5.1).

Analysis of the safety database showed no difference in the side effect profile in patients taking sildenafil with and without anti-hypertensive medication.

Sildenafil was shown to potentiate the hypotensive effect of acute and chronic nitrates. Therefore, use of nitric oxide donors, organic nitrates or organic nitrites in any form, either regularly or intermittently, with sildenafil is contraindicated (refer to section 4.3).

## 4.6. Fertility, pregnancy and lactation

### Pregnancy

Sildenafil is not indicated for use by women.

### Breast-feeding

Sildenafil is not indicated for use in nursing mothers. No information is available on its secretion into breast milk.

### Fertility

Refer to section 5.3.

## 4.7. Effects on ability to drive and use machines

As transient visual disturbances and dizziness have been reported in some patients taking sildenafil, particularly at the 100 mg dose, patients should be aware of how they react to sildenafil before driving or operating machinery, and the doctor should advise accordingly.

## 4.8. Undesirable effects

### Clinical data

Sildenafil was administered to over 3700 patients (aged 19-87) during clinical trials worldwide. Over 550 patients were treated for longer than one year. Treatment with sildenafil was well tolerated. In placebo controlled clinical studies, the discontinuation rate due to adverse events was low and similar to placebo. The adverse events were generally transient and mild to moderate in nature.

Across trials of all designs, the profile of adverse events reported by patients receiving sildenafil was similar. In fixed dose studies, the incidence of adverse events increased with dose. The nature of the adverse events in flexible dose studies, which more closely reflect the recommended dosage regimen, was similar to that for fixed dose studies.

When sildenafil was taken as recommended (on an as needed basis in flexible dose placebo controlled clinical trials) the following adverse events were reported:

**Table 1 Adverse Events Reported by  $\geq$  2% of Patients Treated with sildenafil or Placebo in PRN Flexible Dose Phase II/III Studies**

Adverse event	Percentage of Patients Reporting Event	
	SILDENAFIL (N=734)	PLACEBO (N=725)
Headache	16%	4%
Flushing	10%	1%
Dyspepsia	7%	2%
Nasal congestion	4%	2%



Urinary tract infection	3%	2%
Abnormal vision <sup>+</sup>	3%	0%
Diarrhoea	3%	1%
Dizziness	2%	1%
Rash	2%	1%

<sup>+</sup> Abnormal Vision: Mild and transient predominantly colour tinge to vision, but also increased perception to light or blurred vision. In these studies, only one patient discontinued due to abnormal vision. This effect was more common at doses of 100 mg or more.

Other adverse reactions occurred at a rate of >2%, but equally commonly on placebo: respiratory tract infection, back pain, flu syndrome and arthralgia.

In fixed dose studies, dyspepsia (17%) and abnormal vision (11%) were more common at 100 mg than at lower doses.

At doses above the recommended dose range, adverse events were similar to those detailed above but generally were reported more frequently.

No cases of priapism were reported during controlled clinical trials.

The following events occurred in <2% of patients in controlled clinical trials; a causal relationship to sildenafil is uncertain. Reported events include those with a plausible relation to drug use; omitted are minor events and reports too imprecise to be meaningful.

#### **Infections and infestations**

Infections, rhinitis, sinusitis, bronchitis, laryngitis, pharyngitis, herpes simplex, gastroenteritis, gingivitis, cystitis.

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

Anaemia and leukopenia.

#### **Immune system disorders**

Hypersensitivity

#### **Metabolism and Nutritional disorders**

Gout, unstable diabetes, hyperglycaemia, hyperuricemia, hypoglycaemic reaction, hypernatremia.

#### **Psychiatric disorders**

Depression, insomnia, abnormal dreams.

#### **Nervous system disorders**

Ataxia, hypertonia, neuralgia, neuropathy, paraesthesia, tremor, vertigo, somnolence, hyporeflexia, hypaesthesia, migraine, syncope, cerebral thrombosis.

**Eye disorders**

Mydriasis, conjunctivitis, photophobia, eye pain, eye haemorrhage, cataract, dry eyes.

**Ear and labyrinth disorders**

Sudden decrease or loss of hearing, tinnitus, ear pain.

**Cardiac disorders**

Angina pectoris, AV block, tachycardia, palpitation, myocardial ischaemia, cardiac arrest, heart failure, cardiomyopathy.

**Vascular disorders**

Shock, hypotension, postural hypotension, vasodilation.

**Respiratory, thoracic and mediastinal disorders**

Respiratory disorder, asthma, dyspnoea, sputum increased, cough increased.

**Gastrointestinal disorders**

Nausea, vomiting, glossitis, colitis, dysphagia, gastritis, oesophagitis, stomatitis, dry mouth, rectal haemorrhage, abdominal pain.

**Skin and subcutaneous tissue disorders**

Urticaria, pruritus, sweating, skin ulcer, contact dermatitis, exfoliative dermatitis, photosensitivity reaction.

**Musculoskeletal and connective tissue disorders**

Arthritis, arthrosis, myalgia, tenosynovitis, bone pain, myasthenia, synovitis.

**Renal and urinary disorders**

Nocturia, urinary frequency, urinary incontinence.

**Reproductive system and breast disorders**

Prostatic disorder, breast enlargement, abnormal ejaculation, genital oedema and anorgasmia.

**General disorders and administrative site conditions**

Face oedema, oedema, peripheral oedema, asthenia, pain, chills, chest pain, thirst.

**Investigations**

Abnormal electrocardiogram, liver function tests abnormal

**Injury, poisoning and procedural complications**

Accidental injury, accidental fall, tendon rupture.

Adverse reactions reported in clinical trials that are not included in the above section include:

**Eye disorders**

Visual disturbances, cyanopsia, photopsia, chromatopsia, ocular hyperaemia, visual brightness, eye oedema, eye swelling, dry eye, asthenopia, halo vision, xanthopsia, erythropsia, eye disorder, conjunctival hyperaemia, eye irritation, abnormal sensation in eye, eyelid oedema.

**Vascular disorders**

Hot flush.

**Respiratory, thoracic and mediastinal disorders**

Sinus congestion, epistaxis, throat tightness, nasal dryness, nasal oedema.

**Gastrointestinal disorders**

Gastro-oesophageal reflux disease, hypoaesthesia oral.

**Musculoskeletal and connective tissue disorders**

Pain in extremity.

**Reproductive system and breast disorders**

Erection increased.

**General disorders and administration site conditions**

Feeling hot, irritability.

**Investigations**

Heart rate increased.

**Post marketing data**

**Cardiac disorders and Vascular disorders**

Serious cardiovascular events, including myocardial infarction, sudden cardiac death, ventricular arrhythmia, cerebrovascular haemorrhage, transient ischaemic attack and hypertension, have been reported post marketing in temporal association with the use of sildenafil. Most, but not all, of these patients had pre-existing cardiovascular risk factors. Many of these events were reported to occur during or shortly after sexual activity, and a few were reported to occur shortly after the use of sildenafil without sexual activity. Others were reported to have occurred hours to days after the use of sildenafil and sexual activity. It is not possible to determine whether these events are related directly to sildenafil, to sexual activity, to the patient's underlying cardiovascular disease, to a combination of these factors, or to other factors. Tachycardia, hypotension, syncope, and epistaxis have also been reported post marketing. Rare spontaneous reports have been received of hypotensive events after the use of sildenafil in combination with alpha blockers.

Other events reported post marketing to have been observed in temporal association with sildenafil and not listed in the clinical trials adverse reactions section include:

#### **Nervous system disorders**

Seizure, seizure recurrence and anxiety.

#### **Reproductive system and breast cancer**

Priapism and prolonged erection.

#### **Renal and urinary disorders**

Haematuria

#### **Eye disorders**

Diplopia, temporary vision loss/decreased vision, ocular redness or bloodshot appearance, ocular burning, ocular swelling/pressure, increased intraocular pressure, retinal vascular disease or bleeding, vitreous detachment/traction and paramacular oedema.

Non-arteritic anterior ischaemic optic neuropathy (NAION), a cause of decreased vision including permanent loss of vision, has been reported rarely post-marketing in temporal association with the use of phosphodiesterase type 5 (PDE5) inhibitors, including sildenafil. Most, but not all, of these patients had underlying anatomic or vascular risk factors for developing NAION, including but not necessarily limited to low cup to disc ratio (“crowded disc”), age over 50, diabetes, hypertension, coronary artery disease, hyperlipidaemia and smoking. An observational study evaluating whether recent use of PDE5 inhibitors, as a class, was associated with acute onset of NAION suggests an increase in the risk of NAION with PDE5 inhibitor use (see section 4.3 and 4.4).

#### **Immune system disorders**

Hypersensitivity reaction.

#### **Ear and labyrinth disorders**

Cases of sudden decrease or loss of hearing have been reported post marketing in temporal association with the use of PDE5 inhibitors, including sildenafil.

In some of the cases, medical conditions and other factors were reported that may have also played a role in the otologic adverse events. In many cases, medical follow-up information was limited. It is not possible to determine whether these reported events are related directly to the use of sildenafil, to the patient’s underlying risk factors for hearing loss, a combination of these factors, or to other factors (see section 4.4).

#### **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 reactions <https://nzphvc.otago.ac.nz/reporting/>

## 4.9. Overdose

Overdose information is limited. In studies with healthy volunteers, of single doses up to 800 mg, adverse events were similar to those seen at lower doses, but incidence rates and severities were increased. Survival is reported in a 42-year-old female following an overdose with 2,000 mg sildenafil. In cases of overdose, standard supportive measures should be adopted as required. Sildenafil blood levels are not clinically useful. Monitor ECG and blood pressure in symptomatic patients. Renal dialysis is not expected to accelerate clearance as sildenafil is highly bound to plasma protein and not eliminated in the urine.

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

## 5. PHARMACOLOGICAL PROPERTIES

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### 5.1. Pharmacodynamic properties

Pharmacotherapeutic group: Urologicals; drugs used in erectile dysfunction. ATC code: G04BE03.

#### **Mechanism of action**

Sildenafil is an oral therapy for erectile dysfunction which restores impaired erectile function by increasing blood flow to the penis, resulting in a natural response to sexual stimulation.

The physiological mechanism responsible for erection of the penis involves the release of nitric oxide (NO) in the corpus cavernosum during sexual stimulation. Nitric oxide then activates the enzyme, guanylate cyclase, which results in increased levels of cyclic guanosine monophosphate (cGMP), producing smooth muscle relaxation in the corpus cavernosum and allowing inflow of blood.

Sildenafil is a potent and selective inhibitor of cGMP specific phosphodiesterase type 5 (PDE5) which is responsible for degradation of cGMP in the corpus cavernosum. Sildenafil has a peripheral site of action on erections. Sildenafil has no direct relaxant effect on isolated human corpus cavernosum but potently enhances the relaxant effect of NO on this tissue. When the NO/cGMP pathway is activated, as occurs with sexual stimulation, inhibition of PDE5 by sildenafil results in increased corpus cavernosal levels of cGMP. Therefore, sexual stimulation is required in order for sildenafil to produce its beneficial pharmacological effects.

Single oral doses of sildenafil up to 100 mg in healthy volunteers produced no clinically relevant effects on ECG. The mean maximum decreases in supine systolic blood pressure following 100 mg oral dosing was 8.4 mmHg. The corresponding change in supine diastolic blood pressure was 5.5 mmHg. These decreases in blood pressure are consistent with the vasodilatory effects of sildenafil, probably due to increased cGMP levels in vascular smooth muscle.

Sildenafil has no effect on visual acuity or contrast sensitivity. Mild and transient differences in colour discrimination (blue/green) were detected in some subjects using Farnsworth-Munsell

100 hue test at 1 hour following a 100 mg dose, with no effects evident after 2 hours post-dose. The postulated mechanism for this change in colour discrimination is related to inhibition of PDE6, which is involved in the phototransduction cascade of the retina. *In-vitro* studies show that sildenafil is 10-fold less potent against PDE6 than PDE5.

Studies *in-vitro* have shown that sildenafil has between 10 and 10,000-fold greater selectivity for PDE5 than for other phosphodiesterase isoforms (PDEs 1, 2, 3, 4, 6, 7 to 11). In particular, sildenafil has greater than 4,000-fold selectivity for PDE5 over PDE3, the cAMP specific phosphodiesterase isoform involved in the control of cardiac contractility.

### **Clinical trials**

The efficacy and safety of sildenafil was evaluated in 21 randomised, double-blind placebo-controlled trials of up to 6 months duration. Sildenafil was administered to more than 3,000 patients aged 19-87, with erectile dysfunction (ED) of various aetiologies (organic, psychogenic, mixed). The efficacy was evaluated by global assessment question, diary of erections, the International Index of Erectile Function (IIEF, a validated sexual function questionnaire) and a partner questionnaire.

Sildenafil efficacy, determined as the ability to achieve and maintain an erection sufficient for sexual intercourse, was demonstrated in all 21 studies and was maintained in long term extension studies (one year). In fixed dose studies the proportions of patients reporting that treatment improved their erections were 62% (25 mg), 74% (50 mg) and 82% (100 mg), compared to 25% on placebo. In addition to improvements in erectile function, analysis of IIEF showed that sildenafil treatment also improved the domains of orgasm, satisfaction with intercourse and overall satisfaction.

Across all trials, the proportion of patients reporting improvement on sildenafil were 59% of diabetic patients, 43% of radical prostatectomy patients and 83% of patients with spinal cord injury (versus 16%, 15% and 12% on placebo respectively).

Two clinical studies were specifically designed to assess the time window after dosing during which sildenafil could produce an erection in response to sexual stimulation. In a penile plethysmography (RigiScan) study of fasted patients, the median time to onset for those who obtained erections of 60% rigidity (sufficient for sexual intercourse) was 25 minutes (range 12-37 minutes) on sildenafil. In a separate RigiScan study, sildenafil was still able to produce an erection in response to sexual stimulation 4–5 hours post dose.

## **5.2. Pharmacokinetic properties**

### **Absorption**

Sildenafil is rapidly absorbed. Maximum plasma concentrations are reached within 30 to 120 minutes (median 60 minutes) of oral dosing in the fasted state. The mean absolute oral bioavailability is 41% (range 25–63%). The oral pharmacokinetics of sildenafil is proportional over the recommended dose range (25–100 mg).

When sildenafil is taken with a high fat meal, the rate of absorption is reduced with a mean delay in  $T_{max}$  of 60 minutes and a mean reduction in  $C_{max}$  of 29%. Patients may need to individualise their dosing relative to their food intake based on their own experienced clinical response.

### **Distribution**

The mean steady state volume of distribution ( $V_{ss}$ ) for sildenafil is 105 L, indicating distribution into the tissues. Sildenafil and its major circulating N-desmethyl metabolite are both approximately 96% bound to plasma proteins. Protein binding is independent of total drug concentrations.

In sixteen healthy volunteers receiving sildenafil (100 mg single dose), the mean semen concentrations of sildenafil 1.5 and 4 hours post-dose were 18% and 17% respectively of the plasma concentration at the same time point. The amount in the ejaculate at 90 minutes after dosing was less than 0.0002% of the administered dose.

### **Biotransformation**

Sildenafil is cleared predominantly by the CYP3A4 (major route) and CYP2C9 (minor route) hepatic microsomal isoenzymes. The major circulating metabolite results from N-demethylation of sildenafil. This metabolite has a PDE selectivity profile similar to sildenafil and an *in-vitro* potency for PDE5 approximately 50% of the parent drug. Plasma concentrations of this metabolite are approximately 40% of those seen for sildenafil. The N-desmethyl metabolite is further metabolised, with a terminal half-life of approximately 4 hours.

### **Elimination**

The total body clearance of sildenafil is 41 L/h with a resultant terminal phase half-life of 3–5 hours. After either oral or intravenous administration, sildenafil is excreted as metabolites predominantly in the faeces (approximately 80% of the administered oral dose) and to a lesser extent in the urine (approximately 13% of the administered oral dose).

### **Special populations**

#### ***Elderly***

Healthy elderly volunteers (>65 years) had a reduced clearance of sildenafil, with free plasma concentrations approximately 40% greater than those seen in younger volunteers (18–45 years), however, analysis of the safety database showed that age had no effect on the incidence of adverse events.

#### ***Renal insufficiency***

In volunteers with mild ( $Cl_{cr} = 50–80$  mL/min) and moderate ( $Cl_{cr} = 30–49$  mL/min) renal impairment, the pharmacokinetics of a single oral dose of sildenafil (50 mg) were not altered. In volunteers with severe ( $Cl_{cr} \leq 30$  mL/min) renal impairment, sildenafil clearance was reduced,

resulting in increases in AUC (100%) and  $C_{max}$  (88%) compared to age-matched volunteers with no renal impairment.

### ***Hepatic insufficiency***

In volunteers with hepatic cirrhosis (Child-Pugh classification A and B), sildenafil clearance was reduced, resulting in increases in AUC (85%) and  $C_{max}$  (47%) compared to age-matched volunteers with no hepatic impairment. The pharmacokinetics of sildenafil in patients with severe hepatic impairment have not been studied.

## **5.3. Preclinical safety data**

### **Carcinogenicity**

Sildenafil shows no evidence of any mutagenic or carcinogenic potential.

There was no effect on sperm motility or morphology after single 100 mg oral doses of sildenafil in healthy volunteers although there are no data in patients with erectile dysfunction.

### **Reproductive and developmental toxicity**

No evidence of teratogenicity, embryotoxicity or fetotoxicity was observed in rats and rabbits which received up to 200 mg/kg/day during organogenesis. The dose results in total systemic drug exposure (AUC) for unbound sildenafil and its major metabolite of greater than 60 times the exposure observed in human males given the maximum recommended human dose (MRHD) of 100 mg. In the rat pre- and postnatal development study, the no observed adverse effect dose was 30 mg/kg/day given for 36 days. In non-pregnant rat the AUC at this dose was about 20 times human AUC. There are no adequate and well controlled studies of sildenafil in pregnant women.

## **6. PHARMACEUTICAL PARTICULARS**

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### **6.1. List of excipients**

Silvasta tablets contains croscarmellose sodium, hypromellose, lactose monohydrate, indigo carmine, macrogol 6000, magnesium stearate, microcrystalline cellulose, povidone, and titanium dioxide.

### **6.2. Incompatibilities**

Not applicable.

### **6.3. Shelf life**

36 months.



#### **6.4. Special precautions for storage**

Store at or below 25°C.

#### **6.5. Nature and contents of container**

Blister pack, PVC/PVDC aluminium of 1, 2, 4, 8 and 12 tablets.

Not all strengths or pack sizes may be 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**

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Prescription medicine

### **8. SPONSOR**

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Douglas Pharmaceuticals Ltd

P O Box 45 027

Auckland 0651

New Zealand

Phone: (09) 835 0660

### **9. DATE OF FIRST APPROVAL**

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2 December 2010

### **10. DATE OF REVISION OF THE TEXT**

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30 March 2021

Summary table of changes

<b>Section Changed</b>	<b>Summary of new information</b>
4.3	Addition of safety information to include ointment dosage form for glyceryl trinitrate