

## **1. NAME OF THE MEDICINAL PRODUCT**

CALIBERI Orodispersible Film 5mg

CALIBERI Orodispersible Film 20mg

## **2. QUALITATIVE AND QUANTITATIVE COMPOSITION**

Each orodispersible film contains 5mg or 20mg tadalafil.

For the full list of excipients, see section 6.1.

## **3. PHARMACEUTICAL FORM**

Orodispersible Film (ODF)

CALIBERI Orodispersible Film (ODF) 5mg and 20mg are light yellow, rectangular, orodispersible films.

## **4. CLINICAL PARTICULARS**

### **4.1. Therapeutic indications**

Treatment of erectile dysfunction (ED) in adult males. In order for CALIBERI ODF to be effective for the treatment of ED, sexual stimulation is required.

Treatment of the signs and symptoms of benign prostatic hyperplasia (BPH).

Treatment of erectile dysfunction and the signs and symptoms of benign prostatic hyperplasia (ED/BPH).

CALIBERI ODF is not indicated for use by women.

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

For oral use. CALIBERI ODF should be taken without food. CALIBERI ODF must be immediately used once taken out of the pouch and it can be dissolved on the tongue, with or without any water.

#### **Erectile Dysfunction in adult men**

##### *CALIBERI ODF for Use as Needed*

The recommended dose is 10mg (2x 5mg CALIBERI ODF) taken prior to anticipated sexual activity. In those patients in whom CALIBERI ODF 10mg does not produce an adequate effect, the maximum dose is 20mg and the maximum dosing frequency is once per day. It may be taken from 30 minutes to 36 hours prior to sexual activity. CALIBERI ODF 10mg and 20mg is intended for use prior to anticipated sexual activity and it is not recommended for continuous daily use.

##### *CALIBERI ODF for Once Daily Use*

In patients who anticipate a frequent use of CALIBERI ODF (i.e. at least twice weekly) a once daily regimen with the lowest doses of CALIBERI ODF might be considered suitable, based on patient choice and the physician's judgement. The maximum recommended dose is 5mg (one 5mg CALIBERI ODF) once a day, taken at approximately the same time every day, without regard to timing of sexual activity. The appropriateness of continued use of the daily regimen should be reassessed periodically.

#### **Benign Prostatic Hyperplasia**

The recommended dose is 5mg, taken at approximately the same time every day.

#### **Erectile Dysfunction and Benign Prostatic Hyperplasia**

The recommended dose is 5mg, taken at approximately the same time every day, without regard to timing of sexual activity.

#### **Use in elderly men**

Dose adjustments are not required in elderly patients.

### **Use in men with renal impairment**

#### *CALIBERI ODF for Use as Needed*

- Mild (creatinine clearance 51 to 80mL/min): No dose adjustment is required.
- Moderate (creatinine clearance 31 to 50mL/min): A starting dose of 5mg not more than once per day is recommended, and the maximum dose is 10mg not more than once in every 48 hours.
- Severe (creatinine clearance <30mL/min or on hemodialysis): The maximum dose is 5mg not more than once in every 72 hours (see section 4.4 and 5.2).

#### *CALIBERI ODF for Once Daily Use*

- Mild (creatinine clearance 51 to 80mL/min): No dose adjustment is required.
- Moderate (creatinine clearance 31 to 50mL/min): No dose adjustment is required.
- Severe (creatinine clearance <30mL/min or on hemodialysis): CALIBERI ODF for once daily use is not recommended (see section 4.4 and 5.2).

### **Use in men with hepatic impairment**

#### *CALIBERI ODF for Use as Needed*

The recommended dose is 10mg taken prior to anticipated sexual activity. There is limited clinical data on the safety of CALIBERI ODF in patients with severe hepatic impairment (Child-Pugh Class C); if prescribed, a careful individual benefit/risk evaluation should be undertaken by the prescribing physician. There are no available data about the administration of doses higher than 10mg of CALIBERI ODF to patients with hepatic impairment.

#### *CALIBERI ODF for Once Daily Use*

Once-a-day dosing has not been extensively evaluated in patients with hepatic impairment; therefore, if prescribed, a careful individual benefit/risk evaluation should be undertaken by the prescribing physician (see section 4.4 and 5.2).

### **Use in men with diabetes**

Dose adjustments are not required in diabetic patients.

### **Paediatric population**

CALIBERI ODF should not be used in individuals below 18 years of age.

### **Use in patients taking CYP3A4 Inhibitors**

#### *CALIBERI ODF for Use as Needed*

For patients taking concomitant potent inhibitors of CYP3A4, such as ketoconazole or ritonavir, the maximum recommended dose of CALIBERI ODF is 10mg, not to exceed once every 72 hours (see section 4.4 and 4.5)

#### *CALIBERI ODF for Once Daily Use*

For patients taking concomitant potent inhibitors of CYP3A4, such as ketoconazole or ritonavir, the maximum recommended dose of CALIBERI ODF is 2.5mg (see section 4.4 and 4.5). Caliberi ODF should not be used in these patients since the 2.5mg film dosage is unavailable.

### **4.3. Contraindications**

Hypersensitivity to the active substance or to any of the excipients.

In clinical studies, Tadalafil was shown to augment the hypotensive effects of nitrates. This is thought to result from the combined effects of nitrates and Tadalafil on the nitric oxide/cGMP pathway. Therefore, administration of Tadalafil to patients who are using any form of organic nitrate is contraindicated (see

section 4.5).

Tadalafil should not be used in men with cardiac disease for whom sexual activity is inadvisable. Physicians should consider the potential cardiac risk of sexual activity in patients with pre-existing cardiovascular disease.

The following groups of patients with cardiovascular disease were not included in clinical trials and the use of Tadalafil is therefore contraindicated:

- patients with myocardial infarction within the last 90 days
- patients with unstable angina or angina occurring during sexual intercourse
- patients with New York Heart Association Class 2 or greater heart failure in the last 6 months
- patients with uncontrolled arrhythmias, hypotension (<90/50mmHg), or uncontrolled hypertension
- patients with a stroke within the last 6 months

Tadalafil is contraindicated in patients who have loss of vision in one eye because of non-arteritic anterior ischaemic optic neuropathy (NAION), regardless of whether this episode was in connection or not with previous PDE5 inhibitor exposure (see section 4.4).

The co-administration of PDE5 inhibitors, including Tadalafil, with guanylate cyclase stimulators, such as riociguat, is contraindicated as it may potentially lead to symptomatic hypotension (see section 4.5).

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

##### **Before treatment with CALIBERI ODF**

A medical history and physical examination should be undertaken to diagnose ED or BPH and determine potential underlying causes, before pharmacological treatment is considered.

Prior to initiating any treatment for ED, physicians should consider the cardiovascular status of their patients, since there is a degree of cardiac risk associated with sexual activity. Tadalafil has vasodilator properties, resulting in mild and transient decreases in blood pressure (see section 5.1) and as such potentiate the hypotensive effect of nitrates (see section 4.3).

The evaluation of ED should include a determination of potential underlying causes and the identification of appropriate treatment following an appropriate medical assessment. It is not known if Tadalafil is effective in patients who have undergone pelvic surgery or radical non-nerve-sparing prostatectomy.

Prior to initiating treatment with CALIBERI ODF for BPH, patients should be examined to rule out the presence of carcinoma of the prostate and carefully assessed for cardiovascular conditions.

##### **Cardiovascular**

Serious cardiovascular events, including myocardial infarction, sudden cardiac death, unstable angina pectoris, ventricular arrhythmia, stroke, transient ischemic attacks, chest pain, palpitations and tachycardia, have been reported either post-marketing and/or in clinical trials. Most of the patients in whom these events have been reported had pre-existing cardiovascular risk factors. However, it is not possible to definitively determine whether these events are related directly to these risk factors, to Tadalafil, to sexual activity or to a combination of these or other factors.

In patients receiving concomitant anti-hypertensive medicinal products, Tadalafil may induce a blood pressure decrease. When initiating daily treatment with Tadalafil, appropriate clinical considerations should be given to a possible dose adjustment of the anti-hypertensive therapy.

In patients who are taking alpha<sub>1</sub> blockers, such as doxazosin, concomitant administration of Tadalafil may lead to symptomatic hypotension in some patients (see section 4.5). Therefore, the combination of Tadalafil and alpha blockers is not recommended.

#### Vision

Visual defects and cases of NAION have been reported in connection with the intake of Tadalafil and other PDE5 inhibitors. Analyses of observational data suggest an increased risk of acute NAION in men with erectile dysfunction following exposure to Tadalafil or other PDE5 inhibitors. As this may be relevant for all patients exposed to Tadalafil, the patient should be advised that in case of sudden visual defect, he should stop taking Tadalafil and consult a physician immediately (see section 4.3).

#### Renal and hepatic impairment

Due to increased Tadalafil exposure (AUC), limited clinical experience and the lack of ability to influence clearance by dialysis, once-a-day dosing of Tadalafil is not recommended in patients with severe renal impairment.

There are limited clinical data on the safety of single-dose administration of Tadalafil in patients with severe hepatic impairment (Child-Pugh Class C). Once-a-day administration has not been evaluated in patients with hepatic impairment. If Tadalafil is prescribed, a careful individual benefit/risk evaluation should be undertaken by the prescribing physician.

#### Priapism and anatomical deformation of the penis

Patients who experience erections lasting 4 hours or more should be instructed to seek immediate medical assistance. If priapism is not treated immediately, penile tissue damage and permanent loss of potency may result.

Tadalafil 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).

#### Use with CYP3A4 inhibitors

Caution should be exercised when prescribing Tadalafil to patients using potent CYP3A4 inhibitors (ritonavir, saquinavir, ketoconazole, itraconazole and erythromycin) as increased Tadalafil exposure (AUC) has been observed if the medicinal products are combined (see section 4.2 and 4.5).

#### Tadalafil and other treatments for erectile dysfunction

The safety and efficacy of combinations of Tadalafil and other PDE5 inhibitors or other treatments for ED have not been studied. Therefore, the use of such combinations is not recommended.

#### Hearing

Cases of sudden hearing loss have been reported after the use of Tadalafil. Although other risk factors were present in some cases (such as age, diabetes, hypertension and previous hearing loss history) patients should be advised to stop taking Tadalafil and seek prompt medical attention in the event of sudden decrease or loss of hearing.

### **4.5. Effects of other medicinal products on Tadalafil and other forms of interaction**

Interaction studies were conducted with Tadalafil 10mg and/or 20mg, as indicated below. With regard to those interaction studies where only the Tadalafil 10mg dose was used, clinically relevant interactions at higher doses cannot be completely ruled out.

## **Effects of other medicinal products on Tadalafil**

### Cytochrome P450 inhibitors

Tadalafil is principally metabolised by CYP3A4. A selective inhibitor of CYP3A4, ketoconazole 200mg daily, increased Tadalafil 10mg exposure (AUC) 2-fold and C<sub>max</sub> by 15%, relative to the AUC and C<sub>max</sub> values for Tadalafil alone. Ketoconazole 400mg daily increased Tadalafil 20mg exposure (AUC) 4-fold and C<sub>max</sub> by 22%. Ritonavir (500mg or 600mg twice daily at steady state), an inhibitor of CYP3A4, CYP2C9, CYP2C19 and CYP2D6, increased Tadalafil 20mg single-dose exposure (AUC) by 32% with a 30% reduction in C<sub>max</sub>, relative to the values for Tadalafil 20mg alone. Ritonavir 200mg twice daily, increased Tadalafil 20mg single-dose exposure (AUC) by 124% with no change in C<sub>max</sub>, relative to the values for Tadalafil 20mg alone. Although specific interactions have not been studied, other protease inhibitors, such as saquinavir, and other CYP3A4 inhibitors, such as erythromycin, clarithromycin, itraconazole and grapefruit juice should be co-administered with caution as they would be expected to increase plasma concentrations of Tadalafil (see section 4.4). Consequently the incidence of the adverse reactions listed in section 4.8 might be increased.

### Transporters

The role of transporters (for example p-glycoprotein) in the disposition of Tadalafil is not known. Therefore, there is the potential of drug interactions mediated by inhibition of transporters.

### Cytochrome P450 inducers

A CYP3A4 inducer, rifampicin, reduced Tadalafil AUC by 88%, relative to the AUC values for Tadalafil 10mg alone. This reduced exposure can be anticipated to decrease the efficacy of Tadalafil; the magnitude of decreased efficacy is unknown. Other inducers of CYP3A4 such as phenobarbital, phenytoin and carbamazepine, may also decrease plasma concentrations of Tadalafil.

## **Effects of Tadalafil on other medicinal products**

### Nitrates

In clinical studies, Tadalafil (5, 10 and 20mg) was shown to augment the hypotensive effects of nitrates. Therefore, administration of Tadalafil to patients who are using any form of organic nitrate is contraindicated (see section 4.3). Based on the results of a clinical study in which 150 subjects receiving daily doses of Tadalafil 20mg for 7 days and 0.4mg sublingual nitroglycerin at various times, this interaction lasted for more than 24 hours and was no longer detectable when 48 hours had elapsed after the last Tadalafil dose. Thus, in a patient prescribed any dose of Tadalafil (2.5-20mg), where nitrate administration is deemed medically necessary in a life-threatening situation, at least 48 hours should have elapsed after the last dose of Tadalafil before nitrate administration is considered. In such circumstances, nitrates should only be administered under close medical supervision with appropriate haemodynamic monitoring.

### Anti-hypertensives

In two clinical pharmacology studies, no significant decreases in blood pressure were observed when Tadalafil was co-administered to healthy subjects taking the selective alpha[1A]-adrenergic blocker, tamsulosin. In subjects receiving concomitant Tadalafil (20 mg) and doxazosin (4-8 mg daily), an alpha [1]-adrenergic receptor blocker, there was an augmentation of the blood-pressure-lowering effect of doxazosin. This effect was still present at 12 hours post-dose and had generally disappeared at 24 hours. The number of subjects with potentially clinically significant standing-blood-pressure decreases was greater for the combination. In these clinical pharmacology studies, there were symptoms associated with the decrease in blood pressure including syncope. Therefore, the combination of Tadalafil and alpha blockers is not recommended. It is not known how this extrapolates to other alpha [1A]-adrenergic receptor blocking agents.

In clinical pharmacology studies, the potential for Tadalafil to augment the hypotensive effects of anti-

hypertensive medicinal products was examined. Major classes of anti-hypertensive medicinal products were studied, including calcium channel blockers (amlodipine), ACE-inhibitors (enalapril), beta- adrenergic receptor blockers (metoprolol), thiazide diuretics (bendrofluazide), and angiotensin II receptor blockers (various types and doses, alone or in combination with thiazides, calcium channel blockers, beta blockers and/or alpha blockers). Tadalafil (10mg except for studies with angiotensin II receptor blockers and amlodipine in which a 20mg dose was applied) had no clinically significant interaction with any of these classes. In another clinical pharmacology study, Tadalafil 20mg was studied in combination with up to 4 classes of anti-hypertensives. In subjects taking multiple anti-hypertensives, the ambulatory blood pressure changes appeared to relate to the degree of blood pressure control. In this regard, study subjects whose blood pressure was well controlled, the reduction was minimal and similar to that seen in healthy subjects. In study subjects whose blood pressure was not controlled, the reduction was greater although this reduction was not associated with hypotensive symptoms in the majority of subjects. In patients receiving concomitant anti-hypertensive medicinal products, Tadalafil 20mg may induce a blood pressure decrease, which (with the exception of alpha blockers - see above) is, in general, minor and not likely to be clinically relevant. Analysis of phase 3 clinical trial data showed no difference in adverse events in patients taking Tadalafil with or without anti-hypertensive medicinal products. However, appropriate clinical advice should be given to patients regarding a possible decrease in blood pressure when they are treated with anti-hypertensive medicinal products.

#### 5-alpha reductase inhibitors (5-ARIs)

In a clinical trial that compared Tadalafil 5 mg coadministered with finasteride 5 mg to placebo plus finasteride 5 mg in the relief of BPH symptoms, no new adverse reactions were identified. However, as a formal drug-drug interaction study evaluating the effects of Tadalafil and 5-ARIs has not been performed, caution should be exercised when Tadalafil is co-administered with 5-ARIs.

#### CYP1A2 substrates (e.g. theophylline)

When Tadalafil 10mg was administered with theophylline (a non-selective phosphodiesterase inhibitor) in a clinical pharmacology study, there was no pharmacokinetic interaction. The only pharmacodynamic effect was a small (3.5bpm) increase in heart rate. Although this effect is minor and was of no clinical significance in this study, it should be considered when co-administering these medicinal products.

#### Ethinylestradiol and terbutaline

Tadalafil has been demonstrated to produce an increase in the oral bioavailability of ethinylestradiol; a similar increase may be expected with oral administration of terbutaline, although the clinical consequence of this is uncertain.

#### Alcohol

Alcohol concentrations (mean maximum blood concentration 0.08%) were not affected by co-administration with Tadalafil 10mg or 20mg. In addition, no changes in Tadalafil concentrations were seen 3 hours after co-administration with alcohol. Alcohol was administered in a manner to maximize the rate of alcohol absorption (overnight fast with no food until 2 hours after alcohol). Tadalafil 20mg did not augment the mean blood pressure decrease produced by alcohol (0.7g/kg or approximately 180ml of 40% alcohol [vodka] in an 80-kg male) but in some subjects, postural dizziness and orthostatic hypotension were observed. When Tadalafil was administered with lower doses of alcohol (0.6g/kg), hypotension was not observed and dizziness occurred with similar frequency to alcohol alone. The effect of alcohol on cognitive function was not augmented by Tadalafil 10mg.

#### Cytochrome P450 metabolised medicinal products

Tadalafil is not expected to cause clinically significant inhibition or induction of the clearance of medicinal products metabolised by CYP450 isoforms. Studies have confirmed that Tadalafil does not inhibit or induce

CYP450 isoforms, including CYP3A4, CYP1A2, CYP2D6, CYP2E1, CYP2C9 and CYP2C19.

#### CYP2C9 substrates (e.g. R-warfarin)

Tadalafil 10mg and 20mg had no clinically significant effect on exposure (AUC) to S-warfarin or R-warfarin (CYP2C9 substrate), nor did Tadalafil affect changes in prothrombin time induced by warfarin.

#### Aspirin

Tadalafil 10mg and 20mg did not potentiate the increase in bleeding time caused by aspirin.

#### Anti-diabetic medicinal products

Specific interaction studies with anti-diabetic medicinal products were not conducted.

#### Digoxin

Co-administration of Tadalafil 40mg once per day for 10 days did not have a significant effect on the steady-state pharmacokinetics of digoxin 0.25mg/day in healthy subjects.

#### Riociguat

Preclinical studies showed an additive systemic blood pressure lowering effect when PDE5 inhibitors were combined with riociguat. In clinical studies, riociguat has been shown to augment the hypotensive effects of PDE5 inhibitors. There was no evidence of favourable clinical effect of the combination in the population studied. Concomitant use of riociguat with PDE5 inhibitors, including Tadalafil, is contraindicated (see section 4.3).

### **4.6. Pregnancy and lactation**

Tadalafil is not indicated for use by women. No clinical data on exposed pregnancies are available. Animal studies do not indicate direct or indirect harmful effects with respect to pregnancy, embryonal/foetal development, parturition or postnatal development (see section 5.3).

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

No studies on the effect on the ability to drive or use machines have been performed. Although the frequency of reports of dizziness in placebo and Tadalafil arms in clinical trials was similar, patients should be aware of how they react to Tadalafil, before driving or using machines.

### **4.8. Undesirable effects**

#### **Summary of the safety profile**

The most commonly reported adverse reactions in patients taking Tadalafil for the treatment of ED or BPH were headache, dyspepsia, back pain and myalgia, in which the incidences increase with increasing dose of Tadalafil. The adverse reactions reported were transient, and generally mild or moderate. The majority of headaches reported with Tadalafil once-a-day dosing are experienced within the first 10 to 30 days of starting treatment.

#### **Tabulated summary of adverse reactions**

The table below lists the adverse reactions observed from spontaneous reporting and in placebo-controlled clinical trials (comprising a total of 7116 patients on Tadalafil and 3718 patients on placebo) for on-demand and once-a-day treatment of ED and the once-a-day treatment of BPH.

Frequency convention: Very common ( $\geq 1/10$ ), Common ( $\geq 1/100$  to  $< 1/10$ ), Uncommon ( $\geq 1/1000$  to  $< 1/100$ ), Rare ( $\geq 1/10,000$  to  $< 1/1000$ ), Very rare ( $< 1/10,000$ ) and Not known (cannot be estimated from the available data)



Very common	Common	Uncommon	Rare
<i>Immune system disorders</i>			
		Hypersensitivity reactions	Angioedema <sup>3</sup>
<i>Nervous system disorders</i>			
	Headache	Dizziness	Stroke <sup>1</sup> (including haemorrhagic events), Syncope, Transient ischaemic attacks <sup>1</sup> , Migraine <sup>3</sup> , Seizures <sup>3</sup> , Transient amnesia
<i>Eye disorders</i>			
		Blurred vision, Sensations described as eye pain	Visual field defect, Swelling of eyelids, Conjunctival hyperaemia, Non-arteritic anterior ischemic optic neuropathy (NAION) <sup>3</sup> , Retinal vascular occlusion <sup>3</sup>
<i>Ear and labyrinth disorders</i>			
		Tinnitus	Sudden hearing loss <sup>2</sup>
<i>Cardiac disorders<sup>1</sup></i>			
		Tachycardia, Palpitations	Myocardial infarction, Unstable angina pectoris <sup>3</sup> , Ventricular arrhythmia <sup>3</sup>
<i>Vascular disorders</i>			
	Flushing	Hypotension <sup>4</sup> , Hypertension	
<i>Respiratory, thoracic and mediastinal disorders</i>			
	Nasal congestion	Dyspnoea Epistaxis	
<i>Gastrointestinal disorders</i>			
	Dyspepsia	Abdominal pain, Vomiting, Nausea, Gastro-oesophageal reflux	
<i>Skin and subcutaneous tissue disorders</i>			
		Rash	Urticaria, Stevens-Johnson syndrome <sup>3</sup> , Exfoliative dermatitis <sup>3</sup> Hyperhydrosis (sweating)
<i>Musculoskeletal, connective tissue and bone disorders</i>			
	Back pain, Myalgia, Pain in extremity		
<i>Renal and urinary disorders</i>			
		Haematuria	

<i>Reproductive system and breast disorders</i>			
		Prolonged erections	Priapism, Penile haemorrhage, Haematospermia
<i>General disorders and administration site conditions</i>			
		Chest pain <sup>1</sup> , Peripheral oedema, Fatigue	Facial oedema <sup>3</sup> , Sudden cardiac death <sup>1, 3</sup>

<sup>1</sup> Most of the patients in whom these events have been reported had pre-existing cardiovascular risk factors (see section 4.4).

<sup>2</sup> Sudden decrease or loss of hearing has been reported in a small number of post-marketing and clinical trial cases with the use of all PDE5 inhibitors, including Tadalafil.

<sup>3</sup> Post-marketing surveillance reported adverse reactions not observed in placebo-controlled clinical trials

<sup>4</sup> More commonly reported when Tadalafil is given to patients who are already taking anti-hypertensive medicinal products

#### **Description of selected adverse reactions**

A slightly higher incidence of ECG abnormalities, primarily sinus bradycardia, has been reported in patients treated with Tadalafil once a day as compared with placebo. Most of these ECG abnormalities were not associated with adverse reactions.

#### **Other special populations**

Data in patients over 65 years of age receiving Tadalafil in clinical trials, either for the treatment of erectile dysfunction or the treatment of benign prostatic hyperplasia, are limited. In clinical trials with Tadalafil 5mg taken once a day for the treatment of benign prostatic hyperplasia, dizziness and diarrhoea were reported more frequently in patients over 75 years of age.

#### **4.9. Overdose**

Single doses of up to 500mg have been given to healthy subjects and multiple daily doses up to 100mg have been given to patients. Adverse events were similar to those seen at lower doses. In cases of overdose, standard supportive measures should be adopted as required. Haemodialysis contributes negligibly to Tadalafil elimination.

### **5. PHARMACOLOGICAL PROPERTIES**

#### **5.1. Pharmacodynamic properties**

Pharmacotherapeutic group: Urologicals, Drugs used in erectile dysfunction, ATC Code: G04BE08.

#### **Mechanism of Action**

Tadalafil is a selective, reversible inhibitor of cyclic guanosine monophosphate (cGMP)-specific phosphodiesterase type 5 (PDE5). When sexual stimulation causes the local release of nitric oxide, inhibition of PDE5 by Tadalafil produces increased levels of cGMP in the corpus cavernosum. This results in smooth muscle relaxation and inflow of blood into the penile tissues, thereby producing an erection. Tadalafil has no effect in the treatment of ED in the absence of sexual stimulation.

The effect of PDE5 inhibition on cGMP concentration in the corpus cavernosum is also observed in the smooth muscle of the prostate, the bladder and their vascular supply. The resulting vascular relaxation increases blood perfusion which may be the mechanism by which symptoms of BPH are reduced. These vascular effects may be complemented by inhibition of bladder afferent nerve activity and smooth

muscle relaxation of the prostate and bladder.

### **Pharmacodynamic Effects**

Studies *in vitro* have shown that Tadalafil is a selective inhibitor of PDE5. PDE5 is an enzyme found in the smooth muscle of the corpus cavernosum, prostate and bladder as well as in vascular and visceral smooth muscle, skeletal muscle, platelets, kidney, lung, cerebellum and pancreas. The effect of Tadalafil is more potent on PDE5 than on other phosphodiesterases. Tadalafil is >10,000-fold more potent for PDE5 than for PDE1, PDE2 and PDE4, enzymes which are found in the heart, brain, blood vessels, liver and other organs. Tadalafil is >10,000-fold more potent for PDE5 than for PDE3, an enzyme found in the heart and blood vessels. This selectivity for PDE5 over PDE3 is important because PDE3 is an enzyme involved in cardiac contractility. Additionally, Tadalafil is approximately 700-fold more potent for PDE5 than for PDE6, an enzyme which is found in the retina and is responsible for phototransduction. Tadalafil is also >10,000-fold more potent for PDE5 than for PDE7 through PDE10.

### **Clinical Efficacy and Safety**

Tadalafil administered to healthy subjects produced no significant difference compared to placebo in supine systolic and diastolic blood pressure (mean maximal decrease of 1.6/0.8 mmHg, respectively), in standing systolic and diastolic blood pressure (mean maximal decrease of 0.2/4.6 mmHg, respectively), and no significant change in heart rate.

In a study to assess the effects of Tadalafil on vision, no impairment of colour discrimination (blue/green) was detected using the Farnsworth-Munsell 100-hue test. This finding is consistent with the low affinity of Tadalafil for PDE6 compared to PDE5. Across all clinical studies, reports of changes in colour vision were rare (<0.1%).

Three studies were conducted in men to assess the potential effect on spermatogenesis of Tadalafil 10mg (one 6-month study) and 20mg (one 6-month and one 9-month study) administered daily. In two of these studies decreases were observed in sperm count and concentration related to Tadalafil treatment of unlikely clinical relevance. These effects were not associated with changes in other parameters such as motility, morphology and FSH.

### **Erectile Dysfunction**

For Tadalafil on demand, three clinical studies were conducted in 1054 patients in an at-home setting to define the period of responsiveness. Tadalafil demonstrated statistically significant improvement in erectile function and the ability to have successful sexual intercourse up to 36 hours following dosing, as well as patients' ability to attain and maintain erections for successful intercourse compared to placebo as early as 16 minutes following dosing.

In a 12-week study performed in 186 patients (142 Tadalafil, 44 placebo) with ED secondary to spinal cord injury, Tadalafil significantly improved the erectile function leading to a mean per-subject proportion of successful attempts in patients treated with Tadalafil 10mg or 20mg (flexible-dose, on demand) of 48% as compared to 17% with placebo.

For once-a-day evaluation of Tadalafil at doses of 2.5mg, 5mg and 10mg, three clinical studies were initially conducted involving 853 patients of various ages (range 21-82 years) and ethnicities, with ED of various severities (mild, moderate, severe) and etiologies. Most patients in all three studies were responders to previous on-demand treatment with PDE5 inhibitors. In the two primary efficacy studies of general populations, the mean per-subject proportion of successful attempts were 57 and 67% on Tadalafil 5mg, 50% on Tadalafil 2.5mg as compared to 31 and 37% with placebo. In the study in patients with ED secondary to diabetes, the mean per-subject proportion of successful attempts were 41 and 46% on Tadalafil 5mg and 2.5mg, respectively, as compared to 28% with placebo.

Tadalafil at doses of 2mg to 100mg has been evaluated in 16 clinical studies involving 3250 patients, including patients with ED of various severities (mild, moderate, severe), etiologies, ages (range 21-86 years) and ethnicities. Most patients reported ED of at least 1 year in duration. In the primary efficacy studies of general populations, 81% of patients reported that Tadalafil improved their erections as compared to 35% with placebo. Also, patients with ED in all severity categories reported improved erections whilst taking Tadalafil (86%, 83% and 72% for mild, moderate and severe respectively, as compared to 45%, 42% and 19% with placebo). In the primary efficacy studies, 75% of intercourse attempts were successful in Tadalafil treated patients as compared to 32% with placebo.

### **Benign Prostatic Hyperplasia**

Tadalafil was studied in men with signs and symptoms of BPH in 3 randomized, multi-national, double-blind, placebo-controlled, parallel-design primary efficacy and safety studies of 12 weeks duration. Two of these studies were in men with BPH and one study was specific to men with both ED and BPH.

The first study (LVHG) randomized 1058 patients to receive either Tadalafil 2.5mg, 5mg, 10mg or 20mg for once daily use or placebo. The second study (LVHJ) randomized 325 patients to receive either Tadalafil 5mg for once daily use or placebo. Patients with multiple co-morbid conditions such as diabetes mellitus, hypertension and other cardiovascular disease were included.

In each of these trials (LVHG and LVHJ), Tadalafil 5mg for once daily use resulted in statistically significant improvement in the total International Prostate Symptom Score (IPSS) compared to placebo. Mean total IPSS showed a decrease starting at the first scheduled observation (4 weeks) in Study LVHJ and remained decreased through 12 weeks. In the long-term open-label extension phase of the controlled study LVHG, in which patients received Tadalafil 5mg for up to 1 year after the 12-week double-blind treatment period, the improvement in total IPSS induced by Tadalafil at week 12 of double-blind treatment was maintained over 1 year.

Tadalafil for once a day use was also shown to be effective in treating ED and the symptoms of BPH in patients with both conditions based on results from one of the placebo-controlled, double-blind, parallel-arm efficacy and safety studies which specifically assessed the efficacy and safety of Tadalafil for once a day use in this population (Study LVHR). In this ED and BPH study, Tadalafil 5mg demonstrated statistical superiority over placebo for total IPSS and for the International Index of Erectile Function (IIEF EF) domain score (mean treatment difference, 4.7;  $p < 0.001$ ). The mean per-subject proportion of successful sexual intercourse attempts in this study was 71.9% for Tadalafil 5mg patients compared to 48.3% patients on placebo.

Study LVID randomised 511 patients to receive either Cialis 5mg, tamsulosin 0.4mg or placebo. Cialis 5mg resulted in statistically significant improvement in total IPSS. The efficacy of Cialis 5mg in treating BPH was observed as early as 1 week of therapy and was maintained through 12 weeks. Cialis 5mg for once daily use also improved measures of ED after 12 weeks of treatment compared with placebo in sexually active subjects with ED in the Primary Analysis Population, as demonstrated by statistically significant improvements in IIEF EF domain score (mean difference of the change, 4.0;  $p < 0.001$ ).

Data for each study are shown below.

Study	Treatment arm	No. of patients	Total IPSS		
			Baseline Value	Change from	Difference

			(±SD)	baseline	(95% CI) vs placebo
LVHG	Tadalafil 5mg	205	17.3 (±5.97)	-4.8	-2.6 <sup>a</sup>
	Placebo	205	17.1 (±6.36)	-2.2	(-3.7, -1.5)
LVHJ	Tadalafil 5mg	160	17.1 (±6.06)	-5.6	-1.9 <sup>b</sup>
	Placebo	164	16.6 (±5.99)	-3.6	(-3.2, -0.6)
LVHR	Tadalafil 5mg	206	18.5 (±5.78)	-6.1	-2.3 <sup>a</sup>
	Placebo	194	18.2 (±5.33)	-3.8	(-3.5, -1.2)
LVID	Tadalafil 5mg	171	17.2 (±4.91)	-6.3	-2.1 <sup>c</sup>
					(-3.3, -0.8)
	Tamsulosin 0.4mg	168	16.8 (±5.31)	-5.7	-1.5 <sup>d</sup>
					(-2.8, -0.2)
	Placebo	172	17.4 (±5.97)	-4.2	-

<sup>a</sup> p<0.001 vs placebo

<sup>b</sup> p=0.004 vs placebo

<sup>c</sup> p=0.001 vs placebo

<sup>d</sup> p=0.023 vs placebo

## 5.2. Pharmacokinetic properties Absorption

Tadalafil is readily absorbed after oral administration and the mean maximum observed plasma concentration ( $C_{max}$ ) is achieved at a median time of 2 hours after dosing. Absolute bioavailability of Tadalafil following oral dosing has not been determined. The rate and extent of absorption of Tadalafil are not influenced by food, thus Tadalafil may be taken with or without food. The time of dosing (morning versus evening) had no clinically relevant effects on the rate and extent of absorption.

### Distribution

The mean volume of distribution is approximately 63L, indicating that Tadalafil is distributed into tissues. At therapeutic concentrations, 94% of Tadalafil in plasma is bound to proteins. Protein binding is not affected by impaired renal function. Less than 0.0005% of the administered dose appeared in the semen of healthy subjects.

### Metabolism

Tadalafil is predominantly metabolised by the cytochrome P450 (CYP) 3A4 isoform. The major circulating metabolite is the methylcatechol glucuronide. This metabolite is at least 13,000-fold less potent than Tadalafil for PDE5. Consequently, it is not expected to be clinically active at observed metabolite concentrations.

### Elimination

The mean oral clearance for Tadalafil is 2.5L/h and the mean half life is 17.5 hours in healthy subjects. Tadalafil is excreted predominantly as inactive metabolites, mainly in the faeces (approximately 61% of the dose) and to a lesser extent in the urine (approximately 36% of the dose).

### Linearity/non-linearity

Tadalafil pharmacokinetics in healthy subjects are linear with respect to time and dose. Over a dose range of 2.5mg to 20mg, exposure (AUC) increases proportionally with dose. Steady-state plasma concentrations are attained within 5 days of once-daily dosing. Pharmacokinetics determined with a population approach in patients with ED are similar to pharmacokinetics in subjects without ED.

### Elderly

Healthy elderly subjects (65 years or over), had a lower oral clearance of Tadalafil, resulting in 25% higher exposure (AUC) relative to healthy subjects aged 19 to 45 years. This effect of age is not clinically significant and does not warrant a dose adjustment.

#### **Renal impairment**

In clinical pharmacology studies using single-dose Tadalafil (5-20mg), Tadalafil exposure (AUC) approximately doubled in subjects with mild (creatinine clearance 51 to 80ml/min) or moderate (creatinine clearance 31 to 50ml/min) renal impairment and in subjects with end-stage renal disease on dialysis. In haemodialysis patients,  $C_{max}$  was 41% higher than that observed in healthy subjects. Haemodialysis contributes negligibly to Tadalafil elimination.

#### **Hepatic impairment**

Tadalafil exposure (AUC) in subjects with mild and moderate hepatic impairment (Child-Pugh Class A and B) is comparable to exposure in healthy subjects when a dose of 10mg is administered. There is limited clinical data on the safety of Tadalafil in patients with severe hepatic impairment (Child-Pugh Class C). There are no available data about the administration of once-a-day dosing of Tadalafil to patients with hepatic impairment. If Tadalafil is prescribed once-a-day, a careful individual benefit/risk evaluation should be undertaken by the prescribing physician.

#### **Patients with diabetes**

Tadalafil exposure (AUC) in patients with diabetes was approximately 19% lower than the AUC value for healthy subjects. This difference in exposure does not warrant a dose adjustment.

The bioavailability of Caliberi orodispersible film has been shown to be equivalent to that of Tadalafil tablets in a bioequivalence study conducted under fasting conditions.

### **5.3. Preclinical safety data**

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

There was no evidence of teratogenicity, embryotoxicity or foetotoxicity in rats or mice that received up to 1000mg/kg/day. In a rat pre-natal and post-natal development study, the no observed effect dose was 30mg/kg/day. In the pregnant rat, the AUC for calculated free drug at this dose was approximately 18 times the human AUC at a 20mg dose. There was no impairment of fertility in male and female rats.

In dogs given Tadalafil daily for 6 to 12 months at doses of 25mg/kg/day (resulting in at least a 3-fold greater exposure [range 3.7–18.6] than seen in humans given a single 20mg dose) and above, there was regression of the seminiferous tubular epithelium that resulted in a decrease in spermatogenesis in some dogs (see also section 5.1)

## **6. PHARMACEUTICAL PARTICULARS**

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

Hydroxypropyl cellulose, xanthan gum, glycerin, polyethylene glycol 400, mannitol, simethicone emulsion, titanium oxide, polysorbate 80, sucralose, ferric oxide-Yellow, ferric oxide-Red, vanilla flavor, purified water

### **6.2. Shelf life**

Refer to carton for expiry.

### **6.3. Special precautions for storage**

Store in the original package in order to protect from moisture.  
CALIBERI ODF 5mg and 20mg: Store below 30°C.

**6.4. Nature and contents of container**

Flexible laminate sachets in cartons of 2 or 15 orodispersible films

**7. MARKETING AUTHORIZATION HOLDER**

Abbott Laboratories (Singapore) Pte. Ltd.

3 Fraser Street, #23-28, Duo Tower, Singapore 189352

**8. DATE OF REVISION**

21 December 2022 (SIN-TADA-1222/0)