

# Palbociclib Capsules

## PALBACE®

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### 1. GENERIC NAME

Palbociclib Capsules

### 2. QUALITATIVE AND QUANTITATIVE COMPOSITION

Each hard capsule contains 75 mg, 100 mg and 125 mg of Palbociclib.

List of excipients: Microcrystalline cellulose, lactose monohydrate, sodium starch glycolate, colloidal silicon dioxide, magnesium stearate, and hard gelatin capsule shells. The light orange, light orange/caramel and caramel opaque capsule shells contain gelatin, red iron oxide, yellow iron oxide, and titanium dioxide; and the printing ink contains shellac, titanium dioxide, ammonium hydroxide, propylene glycol and simethicone.

All strengths/presentations of this product may not be marketed.

### 3. DOSAGE FORM AND STRENGTH

Hard gelatin capsules available in 75 mg, 100 mg and 125 mg strengths.

### 4. CLINICAL PARTICULARS

#### 4.1 Therapeutic indication

##### **For Women:**

Palbociclib is indicated for the treatment of hormone receptor (HR)-positive, human epidermal growth factor receptor 2 (HER2)-negative locally advanced or metastatic breast cancer:

- in combination with an aromatase inhibitor;
- in combination with fulvestrant in women who have received prior endocrine therapy (see section 5.2).

In pre- or perimenopausal women, the endocrine therapy should be combined with a luteinizing hormone releasing hormone (LHRH) agonist.

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### **For Men:**

Palbociclib is indicated for the treatment of hormone receptor (HR)-positive, human epidermal growth factor receptor 2 (HER2)-negative advanced or metastatic breast cancer in combination with:

- an aromatase inhibitor as initial endocrine-based therapy.
- fulvestrant in patients who have received prior therapy.

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

Treatment with palbociclib should be initiated and supervised by a physician experienced in the use of anticancer medicinal products.

### **Posology**

The recommended dose is 125 mg of palbociclib once daily for 21 consecutive days followed by 7 days off treatment (Schedule 3/1) to comprise a complete cycle of 28 days. The treatment with palbociclib should be continued as long as the patient is deriving clinical benefit from therapy or until unacceptable toxicity occurs.

When co-administered with palbociclib, the aromatase inhibitor should be administered according to the dose schedule reported in the prescribing information. Treatment of pre/perimenopausal women with the combination of palbociclib plus an aromatase inhibitor should always be combined with an LHRH agonist (see section 4.4).

When co-administered with palbociclib, the recommended dose of fulvestrant is 500 mg administered intramuscularly on Days 1, 15, 29, and once monthly thereafter. Please refer to the prescribing information of fulvestrant. Prior to the start of treatment with the combination of palbociclib plus fulvestrant, and throughout its duration, pre/perimenopausal women should be treated with LHRH agonists according to local clinical practice.

Patients should be encouraged to take their dose at approximately the same time each day. If the patient vomits or misses a dose, an additional dose should not be taken that day. The next prescribed dose should be taken at the usual time.

For men treated with the combination of palbociclib plus aromatase inhibitor therapy, consider treatment with an LHRH agonist according to current clinical practice standards.

### ***Dose adjustments***

Dose modification of palbociclib is recommended based on individual safety and tolerability.

Management of some adverse reactions may require temporary dose interruptions/delays and/or dose reductions, or permanent discontinuation as per dose reduction schedules provided in Tables 1, 2 and 3 (see sections 4.4 and 4.8).

**Table 1. Palbociclib Recommended Dose Modification for Adverse Reactions**

| Dose Level            | Dose       |
|-----------------------|------------|
| Recommended dose      | 125 mg/day |
| First dose reduction  | 100 mg/day |
| Second dose reduction | 75 mg/day* |

\* If further dose reduction below 75 mg/day is required, discontinue the treatment.

Complete blood count should be monitored prior to the start of palbociclib therapy and at the beginning of each cycle, as well as on Day 15 of the first 2 cycles, and as clinically indicated.

For patients who experience a maximum of Grade 1 or 2 neutropenia in the first 6 cycles, complete blood counts for subsequent cycles should be monitored every 3 months, prior to the beginning of a cycle and as clinically indicated.

Absolute neutrophil counts (ANC) of  $\geq 1,000/\text{mm}^3$  and platelet counts of  $\geq 50,000/\text{mm}^3$  are recommended to receive palbociclib.

**Table 2. Palbociclib Dose Modification and Management – Haematological Toxicities**

| CTCAE Grade   | Dose Modifications  |
|---|---|
| Grade 1 or 2  | No dose adjustment is required.   |
| Grade 3 <sup>a</sup>  | <p><u>Day 1 of cycle:</u><br/>Withhold palbociclib, until recovery to Grade <math>\leq 2</math>, and repeat complete blood count monitoring within 1 week. When recovered to Grade <math>\leq 2</math>, start the next cycle at the <i>same dose</i>.</p> <p><u>Day 15 of first 2 cycles:</u><br/>If Grade 3 on Day 15, continue palbociclib at the <i>current dose</i> to complete cycle and repeat complete blood count on Day 22.<br/>If Grade 4 on Day 22, see Grade 4 dose modification guidelines below.</p> <p>Consider dose reduction in cases of prolonged (<math>&gt;1</math> week) recovery from Grade 3 neutropenia or recurrent Grade 3 neutropenia on Day 1 of subsequent cycles.</p> |
| Grade 3 ANC <sup>b</sup><br>( $<1,000$ to $500/\text{mm}^3$ ) +<br>Fever $\geq 38.5^\circ\text{C}$ and/or<br>infection  | <p>At any time:<br/>Withhold palbociclib until recovery to Grade <math>\leq 2</math>.<br/>Resume at next lower dose.</p>  |
| Grade 4 <sup>a</sup>  | <p>At any time:<br/>Withhold palbociclib until recovery to Grade <math>\leq 2</math>.<br/>Resume at next lower dose.</p>  |
| <p>Grading according to CTCAE 4.0.<br/>ANC=absolute neutrophil counts; CTCAE=Common Terminology Criteria for Adverse Events; LLN=lower limit of normal.</p> <p><sup>a</sup> Table applies to all haematological adverse reactions except lymphopenia (unless associated with clinical events, e.g., opportunistic infections).</p> <p><sup>b</sup> ANC: Grade 1: ANC <math>&lt; \text{LLN} - 1,500/\text{mm}^3</math>; Grade 2: ANC <math>1,000 - &lt;1,500/\text{mm}^3</math>; Grade 3: ANC <math>500 - &lt;1,000/\text{mm}^3</math>; Grade 4: ANC <math>&lt;500/\text{mm}^3</math>.</p> |   |

**Table 3. Palbociclib Dose Modification and Management – Non-haematological Toxicities**

| CTCAE Grade  | Dose Modifications   |
|--|--|
| Grade 1 or 2   | No dose adjustment is required.  |
| Grade $\geq 3$ non-haematological toxicity (if persisting despite medical treatment) | Withhold until symptoms resolve to: <ul style="list-style-type: none"> <li>• Grade <math>\leq 1</math>;</li> <li>• Grade <math>\leq 2</math> (if not considered a safety risk for the patient)</li> </ul> Resume at the next lower dose. |

Grading according to CTCAE 4.0.

CTCAE=Common Terminology Criteria for Adverse Events.

Palbociclib should be permanently discontinued in patients with severe interstitial lung disease (ILD)/pneumonitis (see section 4.4).

### Special populations

#### *Elderly*

No dose adjustment of palbociclib is necessary in patients  $\geq 65$  years of age (see section 5.3).

#### *Hepatic Impairment*

No dose adjustment of palbociclib is required for patients with mild or moderate hepatic impairment (Child-Pugh classes A and B). For patients with severe hepatic impairment (Child-Pugh class C), the recommended dose of palbociclib is 75 mg once daily on Schedule 3/1 (see sections 4.4 and 5.3).

#### *Renal Impairment*

No dose adjustment of palbociclib is required for patients with mild, moderate, or severe renal impairment (creatinine clearance [CrCl]  $>15$  mL/min). Insufficient data are available in patients requiring haemodialysis to provide any dose adjustment recommendation in this patient population (see sections 4.4 and 5.3).

#### *Paediatric Population*

The safety and efficacy of palbociclib in children and adolescents  $\leq 18$  years of age have not been established. No data are available.

### Method of Administration

Palbociclib is for oral use. It should be taken with food, preferably a meal to ensure consistent palbociclib exposure (see section 5.3). Palbociclib should not be taken with grapefruit or grapefruit juice (see section 4.5).

Palbociclib capsules should be swallowed whole (should not be chewed, crushed, or opened prior to swallowing). No capsule should be ingested if it is broken, cracked, or otherwise not intact.

### 4.3 Contraindications

Hypersensitivity to the active substance or to any of the excipients listed in section 2.

Use of preparations containing St. John's Wort (see section 4.5).

### 4.4 Special warnings and precautions for use

#### Pre/perimenopausal women

Ovarian ablation or suppression with an LHRH agonist is mandatory when pre/perimenopausal women are administered palbociclib in combination with an aromatase inhibitor, due to the mechanism of action of aromatase inhibitors. Palbociclib in combination with fulvestrant in pre/perimenopausal women has only been studied in combination with an LHRH agonist.

#### Critical visceral disease

The efficacy and safety of palbociclib have not been studied in patients with critical visceral disease (see section 5.2).

#### Haematological disorders

Dose interruption, dose reduction, or delay in starting treatment cycles is recommended for patients who develop Grade 3 or 4 neutropenia. Appropriate monitoring should be performed (see sections 4.2 and 4.8).

#### Interstitial lung disease/pneumonitis

Severe, life-threatening, or fatal ILD and/or pneumonitis can occur in patients treated with palbociclib when taken in combination with endocrine therapy.

Across clinical studies (PALOMA-1, PALOMA-2, PALOMA-3), 1.4% of palbociclib-treated patients had ILD/pneumonitis of any grade, 0.1% had Grade 3, and no Grade 4 or fatal cases were reported. Additional cases of ILD/pneumonitis have been observed in the post-marketing setting, with fatalities reported (see section 4.8).

Patients should be monitored for pulmonary symptoms indicative of ILD/pneumonitis (e.g., hypoxia, cough, dyspnoea). In patients who have new or worsening respiratory symptoms and are suspected to have developed ILD/pneumonitis, palbociclib should be immediately interrupted and the patient should be evaluated. Palbociclib should be permanently discontinued in patients with severe ILD or pneumonitis (see section 4.2).

#### Infections

Since palbociclib has myelosuppressive properties, it may predispose patients to infections.

Infections have been reported at a higher rate in patients treated with palbociclib in randomised clinical

studies compared to patients treated in the respective comparator arm. Grade 3 and Grade 4 infections occurred respectively in 5.6% and 0.9% of patients treated with palbociclib in any combination (see section 4.8).

Patients should be monitored for signs and symptoms of infection and treated as medically appropriate (see section 4.2).

Physicians should inform patients to promptly report any episodes of fever.

#### Venous thromboembolism

Venous thromboembolic events were reported in patients treated with PALBACE (see section 4.8). Patients should be monitored for signs and symptoms of deep vein thrombosis and pulmonary embolism, and treated as medically appropriate.

#### Hepatic impairment

Palbociclib should be administered with caution to patients with moderate or severe hepatic impairment, with close monitoring of signs of toxicity (see sections 4.2 and 5.3).

#### Renal impairment

Palbociclib should be administered with caution to patients with moderate or severe renal impairment, with close monitoring of signs of toxicity (see sections 4.2 and 5.3).

#### Concomitant treatment with inhibitors or inducers of CYP3A4

Strong inhibitors of CYP3A4 may lead to increased toxicity (see section 4.5). Concomitant use of strong CYP3A inhibitors during treatment with palbociclib should be avoided. Co-administration should only be considered after careful evaluation of the potential benefits and risks. If co-administration with a strong CYP3A inhibitor is unavoidable, reduce the palbociclib dose to 75 mg once daily. When the strong inhibitor is discontinued, the dose of palbociclib should be increased (after 3-5 half-lives of the inhibitor) to the dose used prior to the initiation of the strong CYP3A inhibitor (see section 4.5).

Co-administration of CYP3A inducers may lead to decreased palbociclib exposure and consequently a risk for lack of efficacy. Therefore, concomitant use of palbociclib with strong CYP3A4 inducers should be avoided. No dose adjustments are required for co-administration of palbociclib with moderate CYP3A inducers (see section 4.5).

#### Women of childbearing potential or their partners

Women of childbearing potential or their male partners must use a highly effective method of contraception while taking palbociclib (see section 4.6).

#### Lactose

This medicinal product contains lactose. Patients with rare hereditary problems of galactose

intolerance, total lactase deficiency, or glucose-galactose malabsorption should not take this medicinal product.

### Sodium

This medicinal product contains less than 1 mmol (23 mg) sodium per capsule, that is to say essentially 'sodium-free'.

## **4.5 Drugs interactions**

Palbociclib is primarily metabolised by CYP3A and sulphotransferase (SULT) enzyme SULT2A1. *In vivo*, palbociclib is a weak, time-dependent inhibitor of CYP3A.

### Effects of other medicinal products on the pharmacokinetics of palbociclib

#### *Effect of CYP3A inhibitors*

Co-administration of multiple 200 mg doses of itraconazole with a single 125 mg palbociclib dose increased palbociclib total exposure ( $AUC_{inf}$ ) and the peak concentration ( $C_{max}$ ) by approximately 87% and 34%, respectively, relative to a single 125 mg palbociclib dose given alone.

The concomitant use of strong CYP3A inhibitors including, but not limited to: clarithromycin, indinavir, itraconazole, ketoconazole, lopinavir/ritonavir, nefazodone, nelfinavir, posaconazole, saquinavir, telaprevir, telithromycin, voriconazole, and grapefruit or grapefruit juice, should be avoided (see sections 4.2 and 4.4).

No dose adjustments are needed for mild and moderate CYP3A inhibitors.

#### *Effect of CYP3A inducers*

Co-administration of multiple 600 mg doses of rifampin with a single 125 mg palbociclib dose decreased palbociclib  $AUC_{inf}$  and  $C_{max}$  by 85% and 70%, respectively, relative to a single 125 mg palbociclib dose given alone.

The concomitant use of strong CYP3A inducers including, but not limited to: carbamazepine, enzalutamide, phenytoin, rifampin, and St. John's Wort should be avoided (see sections 4.3 and 4.4).

Co-administration of multiple 400 mg daily doses of modafinil, a moderate CYP3A inducer, with a single 125 mg palbociclib dose decreased palbociclib  $AUC_{inf}$  and  $C_{max}$  by 32% and 11%, respectively, relative to a single 125 mg palbociclib dose given alone. No dose adjustments are required for moderate CYP3A inducers (see section 4.4).

### Effect of acid reducing agents

Under fed conditions (intake of a moderate-fat meal), co-administration of multiple doses of the proton pump inhibitor (PPI) rabeprazole with a single dose of 125 mg palbociclib decreased palbociclib  $C_{\max}$  by 41%, but had limited impact on  $AUC_{\text{inf}}$  (13% decrease) compared with a single dose of 125 mg palbociclib administered alone.

Under fasting conditions, the co-administration of multiple doses of the PPI rabeprazole with a single dose of 125 mg palbociclib decreased palbociclib  $AUC_{\text{inf}}$  and  $C_{\max}$  by 62% and 80%, respectively. Therefore, palbociclib should be taken with food, preferably a meal (see sections 4.2 and 5.3).

Given the reduced effect on gastric pH of H<sub>2</sub>-receptor antagonists and local antacids compared to PPIs, no clinically relevant effect of H<sub>2</sub>-receptor antagonists or local antacids on palbociclib exposure is expected when palbociclib is taken with food.

### Effects of palbociclib on the pharmacokinetics of other medicinal products

Palbociclib is a weak, time-dependent inhibitor of CYP3A following daily 125 mg dosing at steady-state. Co-administration of multiple doses of palbociclib with midazolam increased the midazolam  $AUC_{\text{inf}}$  and  $C_{\max}$  values by 61% and 37%, respectively, as compared with administration of midazolam alone.

The dose of sensitive CYP3A substrates with a narrow therapeutic index (e.g., alfentanil, cyclosporine, dihydroergotamine, ergotamine, everolimus, fentanyl, pimecrolimus, quinidine, sirolimus, and tacrolimus) may need to be reduced when co-administered with palbociclib as palbociclib may increase their exposure.

### Drug-drug interaction between palbociclib and letrozole

Data from the drug-drug interaction (DDI) evaluation portion of a clinical study in patients with breast cancer showed that there was no drug interaction between palbociclib and letrozole when the 2 medicinal products were co-administered.

### Effect of tamoxifen on palbociclib exposure

Data from a DDI study in healthy male subjects indicated that palbociclib exposures were comparable when a single dose of palbociclib was co-administered with multiple doses of tamoxifen and when palbociclib was given alone.

### Drug-drug interaction between palbociclib and fulvestrant

Data from a clinical study in patients with breast cancer showed that there was no clinically relevant drug interaction between palbociclib and fulvestrant when the two medicinal products were co-administered.



## Drug-drug interaction between palbociclib and oral contraceptives

DDI studies of palbociclib with oral contraceptives have not been conducted (see section 4.6).

## In vitro studies with transporters

Based on *in vitro* data, palbociclib is predicted to inhibit intestinal P-glycoprotein (P-gp) and breast cancer resistance protein (BCRP) mediated transport. Therefore, administration of palbociclib with medicinal products that are substrates of P-gp (e.g., digoxin, dabigatran, colchicine) or BCRP (e.g., pravastatin, rosuvastatin, sulfasalazine) may increase their therapeutic effect and adverse reactions.

Based on *in vitro* data, palbociclib may inhibit the uptake transporter organic cationic transporter OCT1 and then may increase the exposure of medical product substrates of this transporter (e.g., metformin).

## **4.6 Use in special populations**

### Women of childbearing potential/Contraception in males and females

Females of childbearing potential who are receiving this medicinal product, or their male partners should use adequate contraceptive methods (e.g., double-barrier contraception) during therapy and for at least 3 weeks or 14 weeks after completing therapy for females and males, respectively (see section 4.5).

### Pregnancy

There are no or limited amount of data from the use of palbociclib in pregnant women. Studies in animals have shown reproductive toxicity (see section 6.1). Palbociclib is not recommended during pregnancy and in women of childbearing potential not using contraception.

### Breast-feeding

No studies have been conducted in humans or animals to assess the effect of palbociclib on milk production, its presence in breast milk, or its effects on the breast-fed child. It is unknown whether palbociclib is excreted in human milk. Patients receiving palbociclib should not breast feed.

### Fertility

There were no effects on oestrous cycle (female rats) or mating and fertility in rats (male or female) in non-clinical reproductive studies. However, no clinical data have been obtained on fertility in humans. Based on male reproductive organ findings (seminiferous tubule degeneration in testis, epididymal hypospermia, lower sperm motility and density, and decreased prostate secretion) in non-clinical safety studies, male fertility may be compromised by treatment with palbociclib (see section 6.1). Thus, men may consider sperm preservation prior to beginning therapy with palbociclib.

## 4.7 Effects on ability to drive and use machines

Palbociclib has minor influence on the ability to drive and use machines. However, palbociclib may cause fatigue and patients should exercise caution when driving or using machines.

## 4.8 Undesirable effects

### Summary of the safety profile

The overall safety profile of palbociclib is based on pooled data from 872 patients who received palbociclib in combination with endocrine therapy (N=527 in combination with letrozole and N=345 in combination with fulvestrant) in randomised clinical studies in HR-positive, HER2-negative advanced or metastatic breast cancer.

The most common ( $\geq 20\%$ ) adverse reactions of any grade reported in patients receiving palbociclib in randomised clinical studies were neutropenia, infections, leukopenia, fatigue, nausea, stomatitis, anaemia, diarrhoea, alopecia and thrombocytopenia. The most common ( $\geq 2\%$ ) Grade  $\geq 3$  adverse reactions of palbociclib were neutropenia, leukopenia, infections, anaemia, aspartate aminotransferase (AST) increased, fatigue, and alanine aminotransferase (ALT) increased.

Dose reductions or dose modifications due to any adverse reaction occurred in 38.4% of patients receiving palbociclib in randomised clinical studies regardless of the combination.

Permanent discontinuation due to an adverse reaction occurred in 5.2% of patients receiving palbociclib in randomised clinical studies regardless of the combination.

### Tabulated list of adverse reactions

Table 4 reports the adverse reactions from the pooled dataset of 3 randomised studies. The median duration of palbociclib treatment across the pooled dataset at the time of the final overall survival (OS) analysis was 14.8 months.

Table 5 reports the laboratory abnormalities observed in pooled datasets from 3 randomised studies.

The adverse reactions are listed by system organ class and frequency category. Frequency categories are defined as: very common ( $\geq 1/10$ ), common ( $\geq 1/100$  to  $< 1/10$ ), and uncommon ( $\geq 1/1,000$  to  $< 1/100$ ). Within each frequency grouping, adverse reactions are presented in order of decreasing seriousness.

**Table 4. Adverse Reactions Based on Pooled Dataset from 3 Randomised Studies (N=872)**

| <b>System organ class<br/>Frequency<br/>Preferred term<sup>a</sup> (PT)</b>                   | <b>All Grades<br/>n (%)</b> | <b>Grade 3<br/>n (%)</b> | <b>Grade 4<br/>n (%)</b> |
|---|-----------------------------|--------------------------|--------------------------|
| <b>Infections and infestations</b><br><i>Very common</i><br>Infections <sup>b</sup>           | 516 (59.2)                  | 49 (5.6)                 | 8 (0.9)                  |
| <b>Blood and lymphatic system disorders</b><br><i>Very common</i><br>Neutropenia <sup>c</sup> | 716 (82.1)                  | 500 (57.3)               | 97 (11.1)                |

**Table 4. Adverse Reactions Based on Pooled Dataset from 3 Randomised Studies (N=872)**

| <b>System organ class</b><br><b>Frequency</b><br><b>Preferred term<sup>a</sup> (PT)</b> | <b>All Grades</b><br><b>n (%)</b> | <b>Grade 3</b><br><b>n (%)</b> | <b>Grade 4</b><br><b>n (%)</b> |
|---|-----------------------------------|--------------------------------|--------------------------------|
| Leukopenia <sup>d</sup>   | 424 (48.6)                        | 254 (29.1)                     | 7 (0.8)                        |
| Anaemia <sup>e</sup>  | 258 (29.6)                        | 45 (5.2)                       | 2 (0.2)                        |
| Thrombocytopenia <sup>f</sup>   | 194 (22.2)                        | 16 (1.8)                       | 4 (0.5)                        |
| <i>Common</i><br>Febrile neutropenia  | 12 (1.4)                          | 10 (1.1)                       | 2 (0.2)                        |
| <b>Metabolism and nutrition disorders</b>   |                                   |                                |                                |
| <i>Very common</i><br>Decreased appetite  | 152 (17.4)                        | 8 (0.9)                        | 0 (0.0)                        |
| <b>Nervous system disorders</b>   |                                   |                                |                                |
| <i>Common</i><br>Dysgeusia  | 79 (9.1)                          | 0 (0.0)                        | 0 (0.0)                        |
| <b>Eye disorders</b>  |                                   |                                |                                |
| <i>Common</i><br>Vision blurred   | 48 (5.5)                          | 1 (0.1)                        | 0 (0.0)                        |
| Lacrimation increased   | 59 (6.8)                          | 0 (0.0)                        | 0 (0.0)                        |
| Dry eye   | 36 (4.1)                          | 0 (0.0)                        | 0 (0.0)                        |
| <b>Vascular disorders</b>   |                                   |                                |                                |
| <i>Common</i><br>Venous thromboembolism <sup>*,j</sup>                                  | 28 (3.2)                          | 11 (1.3)                       | 7 (0.8)                        |
| <b>Respiratory, thoracic and mediastinal disorders</b>                                  |                                   |                                |                                |
| <i>Common</i><br>Epistaxis  | 77 (8.8)                          | 0 (0.0)                        | 0 (0.0)                        |
| ILD/pneumonitis <sup>*,i</sup>  | 12 (1.4)                          | 1 (0.1)                        | 0 (0.0)                        |
| <b>Gastrointestinal disorders</b>   |                                   |                                |                                |
| <i>Very common</i><br>Stomatitis <sup>g</sup>   | 264 (30.3)                        | 8 (0.9)                        | 0 (0.0)                        |
| Nausea  | 314 (36.0)                        | 5 (0.6)                        | 0 (0.0)                        |
| Diarrhoea   | 238 (27.3)                        | 9 (1.0)                        | 0 (0.0)                        |
| Vomiting  | 165 (18.9)                        | 6 (0.7)                        | 0 (0.0)                        |
| <b>Skin and subcutaneous tissue disorders</b>   |                                   |                                |                                |
| <i>Very common</i><br>Rash <sup>h</sup>   | 158 (18.1)                        | 7 (0.8)                        | 0 (0.0)                        |
| Alopecia  | 234 (26.8)                        | N/A                            | N/A                            |
| Dry skin  | 93 (10.7)                         | 0 (0.0)                        | 0 (0.0)                        |
| <i>Common</i><br>Palmar-plantar erythrodysesthesia syndrome <sup>*</sup>                | 16 (1.8)                          | 0 (0.0)                        | 0 (0.0)                        |
| <i>Uncommon</i><br>Cutaneous lupus erythematosus <sup>*</sup>                           | 1 (0.1)                           | 0 (0.0)                        | 0 (0.0)                        |
| <b>General disorders and administration site conditions</b>                             |                                   |                                |                                |
| <i>Very common</i><br>Fatigue   | 362 (41.5)                        | 23 (2.6)                       | 2 (0.2)                        |
| Asthenia  | 118 (13.5)                        | 14 (1.6)                       | 1 (0.1)                        |
| Pyrexia   | 115 (13.2)                        | 1 (0.1)                        | 0 (0.0)                        |
| <b>Investigations</b>   |                                   |                                |                                |

**Table 4. Adverse Reactions Based on Pooled Dataset from 3 Randomised Studies (N=872)**

| System organ class<br>Frequency<br>Preferred term <sup>a</sup> (PT) | All Grades<br>n (%) | Grade 3<br>n (%) | Grade 4<br>n (%) |
|---|---------------------|------------------|------------------|
| <i>Very common</i>  |                     |                  |                  |
| ALT increased   | 92 (10.6)           | 18 (2.1)         | 1 (0.1)          |
| AST Increased   | 99 (11.4)           | 25 (2.9)         | 0 (0.0)          |

ALT=alanine aminotransferase; AST=aspartate aminotransferase; ILD=interstitial lung disease; N/n=number of patients; N/A=not applicable.

\* Adverse drug reaction identified post-marketing.

<sup>a</sup> PTs are listed according to MedDRA 17.1.

<sup>b</sup> Infections includes all PTs that are part of the System Organ Class Infections and infestations.

<sup>c</sup> Neutropenia includes the following PTs: Neutropenia, Neutrophil count decreased.

<sup>d</sup> Leukopenia includes the following PTs: Leukopenia, White blood cell count decreased.

<sup>e</sup> Anaemia includes the following PTs: Anaemia, Haemoglobin decreased, Haematocrit decreased.

<sup>f</sup> Thrombocytopenia includes the following PTs: Thrombocytopenia, Platelet count decreased.

<sup>g</sup> Stomatitis includes the following PTs: Aphthous stomatitis, Cheilitis, Glossitis, Glossodynia, Mouth ulceration, Mucosal inflammation, Oral pain, Oropharyngeal discomfort, Oropharyngeal pain, Stomatitis.

<sup>h</sup> Rash includes the following PTs: Rash, Rash maculo-papular, Rash pruritic, Rash erythematous, Rash papular, Dermatitis, Dermatitis acneiform, Toxic skin eruption.

<sup>i</sup> ILD/pneumonitis includes any reported PTs that are part of the Standardised MedDRA Query Interstitial Lung Disease (narrow).

<sup>j</sup> Venous thromboembolism includes the following PTs: pulmonary embolism, embolism, deep vein thrombosis, peripheral embolism, thrombosis.

**Table 5. Laboratory Abnormalities Observed in Pooled Dataset from 3 Randomised Studies (N=872)**

| Laboratory abnormalities | Palbociclib plus letrozole or fulvestrant |           |           | Comparator arms* |           |           |
|--------------------------|---|-----------|-----------|------------------|-----------|-----------|
|                          | All grades %                              | Grade 3 % | Grade 4 % | All grades %     | Grade 3 % | Grade 4 % |
| WBC decreased            | 97.4                                      | 41.8      | 1.0       | 26.2             | 0.2       | 0.2       |
| Neutrophils decreased    | 95.6                                      | 57.5      | 11.7      | 17.0             | 0.9       | 0.6       |
| Anaemia                  | 80.1                                      | 5.6       | N/A       | 42.1             | 2.3       | N/A       |
| Platelets decreased      | 65.2                                      | 1.8       | 0.5       | 13.2             | 0.2       | 0.0       |
| AST increased            | 55.5                                      | 3.9       | 0.0       | 43.3             | 2.1       | 0.0       |
| ALT increased            | 46.1                                      | 2.5       | 0.1       | 33.2             | 0.4       | 0.0       |

WBC=white blood cells; AST=aspartate aminotransferase; ALT=alanine aminotransferase; N=number of patients; N/A=not applicable.

Note: Laboratory results are graded according to the NCI CTCAE version 4.0 severity grade.

\* letrozole or fulvestrant.

### Description of selected adverse reactions

Overall, neutropenia of any grade was reported in 716 (82.1%) patients receiving palbociclib regardless of the combination, with Grade 3 neutropenia being reported in 500 (57.3%) patients, and Grade 4 neutropenia being reported in 97 (11.1%) patients (see Table 4).

The median time to first episode of any grade neutropenia was 15 days (12-700 days) and the median duration of Grade  $\geq 3$  neutropenia was 7 days across 3 randomised clinical studies.

Febrile neutropenia has been reported in 0.9% of patients receiving palbociclib in combination with

fulvestrant and in 1.7% of patients receiving palbociclib in combination with letrozole.

Febrile neutropenia has been reported in about 2% of patients exposed to palbociclib across the overall clinical programme.

#### Reporting of suspected adverse reactions

Reporting suspected adverse reactions after authorisation of the medicinal product is important. It allows continued monitoring of the benefit/risk balance of the medicinal product. Healthcare professionals are asked to report any suspected adverse reactions.

### **4.9 Overdose**

In the event of a palbociclib overdose, both gastrointestinal (e.g., nausea, vomiting) and haematological (e.g., neutropenia) toxicity may occur and general supportive care should be provided.

## **5. PHARMACOLOGICAL PROPERTIES**

### **5.1 Mechanism of Action**

Pharmacotherapeutic group: Antineoplastic agents, protein kinase inhibitors, ATC code: L01EF01.

Palbociclib is a highly selective, reversible inhibitor of cyclin-dependent kinases (CDK) 4 and 6. Cyclin D1 and CDK4/6 are downstream of multiple signalling pathways which lead to cellular proliferation.

### **5.2 Pharmacodynamic properties**

Through inhibition of CDK4/6, palbociclib reduced cellular proliferation by blocking progression of the cell from G1 into S phase of the cell cycle. Testing of palbociclib in a panel of molecularly profiled breast cancer cell lines revealed high activity against luminal breast cancers, particularly ER-positive breast cancers. In the cell lines tested, the loss of retinoblastoma (Rb) was associated with loss of palbociclib activity. However, in a follow-up study with fresh tumour samples, no relation between RB1 expression and tumour response was observed. Similarly, no relation was observed when studying the response to palbociclib in *in vivo* models with patient-derived xenografts (PDX models). Available clinical data are reported in the clinical efficacy and safety section (see section 5.2).

#### Cardiac electrophysiology

The effect of palbociclib on the QT interval corrected for heart rate (QTc) interval was evaluated using time matched electrocardiogram (ECG) evaluating the change from baseline and corresponding pharmacokinetic data in 77 patients with advanced breast cancer. Palbociclib did not prolong the QTc to any clinically relevant extent at the recommended dose of 125 mg daily (Schedule 3/1).

## Clinical efficacy and safety

### *Randomised Phase 3 Study PALOMA-2: Palbociclib in combination with letrozole*

The efficacy of palbociclib in combination with letrozole versus letrozole plus placebo was evaluated in an international, randomised, double-blind, placebo-controlled, parallel-group, multicentre study conducted in women with ER-positive, HER2-negative locally advanced breast cancer not amenable to resection or radiation therapy with curative intent or metastatic breast cancer who had not received prior systemic treatment for their advanced disease.

A total of 666 postmenopausal women were randomised 2:1 to the palbociclib plus letrozole arm or placebo plus letrozole arm and were stratified by site of disease (visceral versus non-visceral), disease-free interval from the end of (neo)adjuvant treatment to disease recurrence (*de novo* metastatic versus  $\leq 12$  months versus  $> 12$  months), and by the type of prior (neo)adjuvant anticancer therapies (prior hormonal therapy versus no prior hormonal therapy). Patients with advanced symptomatic, visceral spread, that were at risk of life-threatening complications in the short term (including patients with massive uncontrolled effusions [pleural, pericardial, peritoneal], pulmonary lymphangitis, and over 50% liver involvement), were not eligible for enrolment into the study.

Patients continued to receive assigned treatment until objective disease progression, symptomatic deterioration, unacceptable toxicity, death, or withdrawal of consent, whichever occurred first. Crossover between treatment arms was not allowed.

Patients were well matched for baseline demographics and prognostic characteristics between the palbociclib plus letrozole arm and the placebo plus letrozole arm. The median age of patients enrolled in this study was 62 years (range 28-89), 48.3% of patients had received chemotherapy and 56.3% had received antihormonal therapy in the (neo)adjuvant setting prior to their diagnosis of advanced breast cancer while 37.2% of patients had received no prior systemic therapy in the (neo)adjuvant setting. The majority of patients (97.4%) had metastatic disease at baseline, 23.6% of patients had bone-only disease, and 49.2% of patients had visceral disease.

The primary endpoint of the study was progression-free survival (PFS) evaluated according to Response Evaluation Criteria in Solid Tumours (RECIST) v1.1, as assessed by investigator. Secondary efficacy endpoints included objective response (OR), clinical benefit response (CBR), safety, and change in quality of life (QoL).

At the data cutoff date of 26-February-2016, the study met its primary objective of improving PFS. The observed hazard ratio (HR) was 0.576 (95% confidence interval [CI]: 0.46, 0.72) in favour of palbociclib plus letrozole, with a stratified log-rank test 1-sided p-value of  $< 0.000001$ . An updated analysis of the primary and secondary endpoints was performed after an additional 15 months of follow up (data cutoff date: 31-May-2017). A total of 405 PFS events were observed; 245 events (55.2%) in the palbociclib plus letrozole arm and 160 (72.1%) in the comparator arm respectively.

Table 6 shows the efficacy results based on the primary and the updated analyses from the PALOMA-2 study, as assessed by the investigator and by the independent review.

**Table 6. PALOMA-2 (Intent-To-Treat Population) - Efficacy Results Based on Primary and Updated Cutoff Dates**

|  | Primary analysis<br>(26 February 2016 cutoff) |  | Updated analysis<br>(31 May 2017 cutoff)   |  |
|--|---|--|--|--|
|  | Palbociclib plus<br>letrozole<br>(N = 444)    | Placebo<br>plus letrozole<br>(N = 222) | Palbociclib plus<br>letrozole<br>(N = 444) | Placebo<br>plus letrozole<br>(N = 222) |
| Progression-free survival by investigator assessment |   |  |  |  |
| Number of events (%)                                 | 194 (43.7)                                    | 137 (61.7)                             | 245 (55.2)                                 | 160 (72.1)                             |
| Median PFS [months<br>(95% CI)]                      | 24.8 (22.1, NE)                               | 14.5 (12.9, 17.1)                      | 27.6 (22.4, 30.3)                          | 14.5 (12.3, 17.1)                      |
| Hazard ratio [(95%<br>CI) and p-value]               | 0.576 (0.463, 0.718), p< 0.000001             |  | 0.563 (0.461, 0.687), p<0.000001           |  |
| Progression-free survival by independent assessment  |   |  |  |  |
| Number of events (%)                                 | 152 (34.2)                                    | 96 (43.2)                              | 193 (43.5)                                 | 118 (53.2)                             |
| Median PFS [months<br>(95% CI)]                      | 30.5 (27.4, NE)                               | 19.3 (16.4, 30.6)                      | 35.7 (27.7, 38.9)                          | 19.5 (16.6, 26.6)                      |
| Hazard ratio (95% CI)<br>and 1-sided p-value         | 0.653 (0.505, 0.844), p=0.000532              |  | 0.611 (0.485, 0.769), p=0.000012           |  |
| OR* [% (95% CI)]                                     | 46.4 (41.7, 51.2)                             | 38.3 (31.9, 45.0)                      | 47.5 (42.8, 52.3)                          | 38.7 (32.3, 45.5)                      |
| OR*       measurable<br>disease [% (95% CI)]         | 60.7 (55.2, 65.9)                             | 49.1 (41.4, 56.9)                      | 62.4 (57.0, 67.6)                          | 49.7 (42.0, 57.4)                      |
| CBR* [% (95% CI)]                                    | 85.8 (82.2, 88.9)                             | 71.2 (64.7, 77.0)                      | 85.6 (82.0, 88.7)                          | 71.2 (64.7, 77.0)                      |

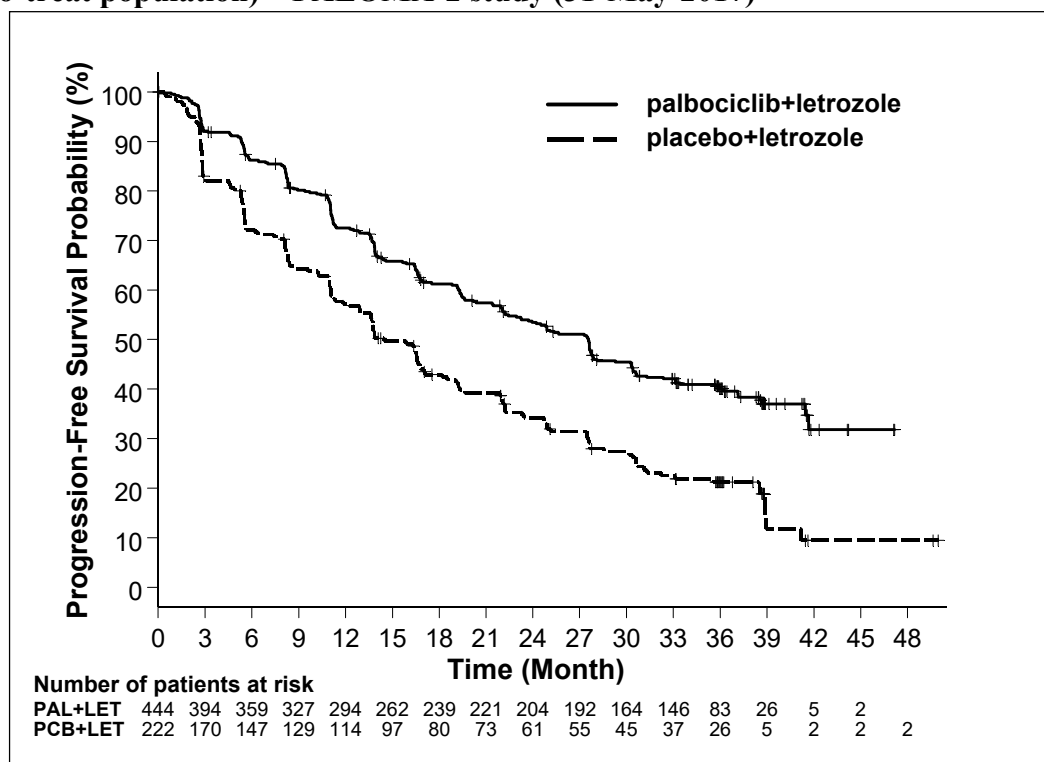
N=number of patients; CI=confidence interval; NE=not estimable; OR=objective response; CBR=clinical benefit response; PFS=progression-free survival.

\* Secondary endpoints results are based on confirmed and unconfirmed responses according to RECIST 1.1.

The Kaplan-Meier curves for PFS based on the updated cutoff date of 31 May 2017 are displayed in Figure 1 below.



**Figure 1. Kaplan-Meier plot of progression-free survival (investigator assessment, intent-to-treat population) – PALOMA-2 study (31-May-2017)**



PAL=palbociclib; LET=letrozole; PCB=placebo.

A series of prespecified subgroup PFS analyses was performed based on prognostic factors and baseline characteristics to investigate the internal consistency of treatment effect. A reduction in the risk of disease progression or death in favour of the palbociclib plus letrozole arm was observed in all individual patient subgroups defined by stratification factors and baseline characteristics in the primary and in the updated analysis.

Based on the 31-May-2017 data cutoff date, this reduction in risk continued to be observed in the following subgroups: (1) patients with either visceral metastases (HR of 0.62 [95% CI: 0.47, 0.81], median progression-free survival [mPFS] 19.3 months versus 12.3 months) or without visceral metastases (HR of 0.50 [95% CI: 0.37, 0.67], mPFS 35.9 months versus 17.0 months) and (2) patients with either bone only disease (HR of 0.41 [95% CI: 0.26, 0.63], mPFS 36.2 months versus 11.2 months) or without bone-only disease (HR of 0.62 [95% CI: 0.50, 0.78], mPFS 24.2 months versus 14.5 months). Similarly, a reduction in the risk of disease progression or death in the palbociclib plus letrozole arm was observed in 512 patients whose tumour tested positive for Rb protein expression by immunohistochemistry (IHC) (HR of 0.543 [95% CI: 0.433, 0.681], mPFS 27.4 months versus 13.7 months). For the 51 patients IHC negative for Rb expression, the difference between treatment arms was not statistically significant (HR of 0.868 [95% CI: 0.424, 1.777], mPFS 23.2 versus 18.5 months) for the palbociclib plus letrozole arm versus the placebo plus letrozole arm, respectively.

Additional efficacy measures (OR and time to response [TTR]) assessed in the sub-groups of patients with or without visceral disease based on the 31-May-2017 updated cutoff date are displayed in Table 7.



**Table 7. Efficacy Results in Patients with Visceral or Non-Visceral Disease from PALOMA-2 Study (Intent-To-Treat Population; 31-May-2017 Cutoff Date)**

|                              | Visceral disease                   |                                | Non-visceral disease               |                                |
|------------------------------|------------------------------------|--------------------------------|------------------------------------|--------------------------------|
|                              | Palbociclib plus letrozole (N=214) | Placebo plus letrozole (N=110) | Palbociclib plus letrozole (N=230) | Placebo plus letrozole (N=112) |
| OR [% (95% CI)]              | 59.8<br>(52.9, 66.4)               | 46.4<br>(36.8, 56.1)           | 36.1<br>(29.9, 42.7)               | 31.3<br>(22.8, 40.7)           |
| TTR, Median [months (range)] | 5.4<br>(2.0, 30.4)                 | 5.3<br>(2.6, 27.9)             | 3.0<br>(2.1, 27.8)                 | 5.5<br>(2.6, 22.2)             |

N=number of patients; CI=confidence interval; OR=objective response based on confirmed and unconfirmed responses according to RECIST 1.1; TTR=time to first tumour response.

At the time of the updated analyses, the median time from randomisation to second subsequent therapy was 38.8 months in the palbociclib + letrozole arm and 28.8 months in the placebo + letrozole arm, HR 0.73 (95% CI: 0.58, 0.91).

#### *Randomised Phase 3 Study PALOMA-3: Palbociclib in combination with fulvestrant*

The efficacy of palbociclib in combination with fulvestrant versus fulvestrant plus placebo was evaluated in an international, randomised, double-blind, parallel-group, multicentre study conducted in women with HR-positive, HER2-negative locally advanced breast cancer not amenable to resection or radiation therapy with curative intent or metastatic breast cancer, regardless of their menopausal status, whose disease progressed after prior endocrine therapy in the (neo)adjuvant or metastatic setting.

A total of 521 pre/peri- and postmenopausal women who had progressed on or within 12 months from completion of adjuvant endocrine therapy or on or within 1 month from prior endocrine therapy for advanced disease, were randomised 2:1 to palbociclib plus fulvestrant or placebo plus fulvestrant and stratified by documented sensitivity to prior hormonal therapy, menopausal status at study entry (pre/peri- versus postmenopausal), and presence of visceral metastases. Pre/perimenopausal women received the LHRH agonist goserelin. Patients with advanced/metastatic, symptomatic, visceral spread, that were at risk of life-threatening complications in the short term (including patients with massive uncontrolled effusions [pleural, pericardial, peritoneal], pulmonary lymphangitis, and over 50% liver involvement), were not eligible for enrolment into the study.

Patients continued to receive assigned treatment until objective disease progression, symptomatic deterioration, unacceptable toxicity, death, or withdrawal of consent, whichever occurred first. Crossover between treatment arms was not allowed.

Patients were well matched for baseline demographics and prognostic characteristics between the palbociclib plus fulvestrant arm and the placebo plus fulvestrant arm. The median age of patients enrolled in this study was 57 years (range 29, 88). In each treatment arm the majority of patients were White, had documented sensitivity to prior hormonal therapy, and were postmenopausal. Approximately 20% of patients were pre/perimenopausal. All patients had received prior systemic therapy and most patients in each treatment arm had received a previous chemotherapy regimen for their primary diagnosis. More than half (62%) had an ECOG PS of 0, 60% had visceral metastases,

and 60% had received more than 1 prior hormonal regimen for their primary diagnosis.

The primary endpoint of the study was investigator-assessed PFS evaluated according to RECIST 1.1. Supportive PFS analyses were based on an Independent Central Radiology Review. Secondary endpoints included OR, CBR, OS, safety, and time-to-deterioration (TTD) in pain endpoint.

The study met its primary endpoint of prolonging investigator-assessed PFS at the interim analysis conducted on 82% of the planned PFS events; the results crossed the prespecified Haybittle-Peto efficacy boundary ( $\alpha=0.00135$ ), demonstrating a statistically significant prolongation in PFS and a clinically meaningful treatment effect. A more mature update of efficacy data is reported in Table 8.

After a median follow-up time of 45 months, the final OS analysis was performed based on 310 events (60% of randomised patients). A 6.9-month difference in median OS in the palbociclib plus fulvestrant arm compared with the placebo plus fulvestrant arm was observed; this result was not statistically significant at the prespecified significance level of 0.0235 (1-sided). In the placebo plus fulvestrant arm, 15.5% of randomised patients received palbociclib and other CDK inhibitors as post progression subsequent treatments.

The results from the investigator-assessed PFS and final OS data from PALOMA-3 study are presented in Table 8. The relevant Kaplan-Meier plots are shown in Figures 2 and 3, respectively.

**Table 8. Efficacy Results – PALOMA-3 Study (Investigator Assessment, Intent-To-Treat Population)**

|   | Updated analysis<br>(23 October 2015 cutoff)   |  |
|---|--|--|
|   | Palbociclib plus<br>fulvestrant<br>(N=347)     | Placebo<br>plus fulvestrant<br>(N=174) |
| <b>Progression-free survival (PFS)</b>                        |  |  |
| Number of events (%)  | 200 (57.6)                                     | 133 (76.4)                             |
| Median [months (95% CI)]                                      | 11.2 (9.5, 12.9)                               | 4.6 (3.5, 5.6)                         |
| Hazard ratio (95% CI) and p-value                             | 0.497 (0.398, 0.620), p<0.000001               |  |
| <b>Secondary efficacy endpoints</b>                           |  |  |
| OR [% (95% CI)]   | 26.2 (21.7, 31.2)                              | 13.8 (9.0, 19.8)                       |
| OR (measurable disease) [% (95% CI)]                          | 33.7 (28.1, 39.7)                              | 17.4 (11.5, 24.8)                      |
| CBR [% (95% CI)]  | 68.0 (62.8, 72.9)                              | 39.7 (32.3, 47.3)                      |
| <b>Final overall survival (OS)<br/>(13 April 2018 cutoff)</b> |  |  |
| Number of events (%)  | 201 (57.9)                                     | 109 (62.6)                             |
| Median [months (95% CI)]                                      | 34.9 (28.8, 40.0)                              | 28.0 (23.6, 34.6)                      |
| Hazard ratio (95% CI) and p-value <sup>†</sup>                | 0.814 (0.644, 1.029)<br>p=0.0429 <sup>†*</sup> |  |

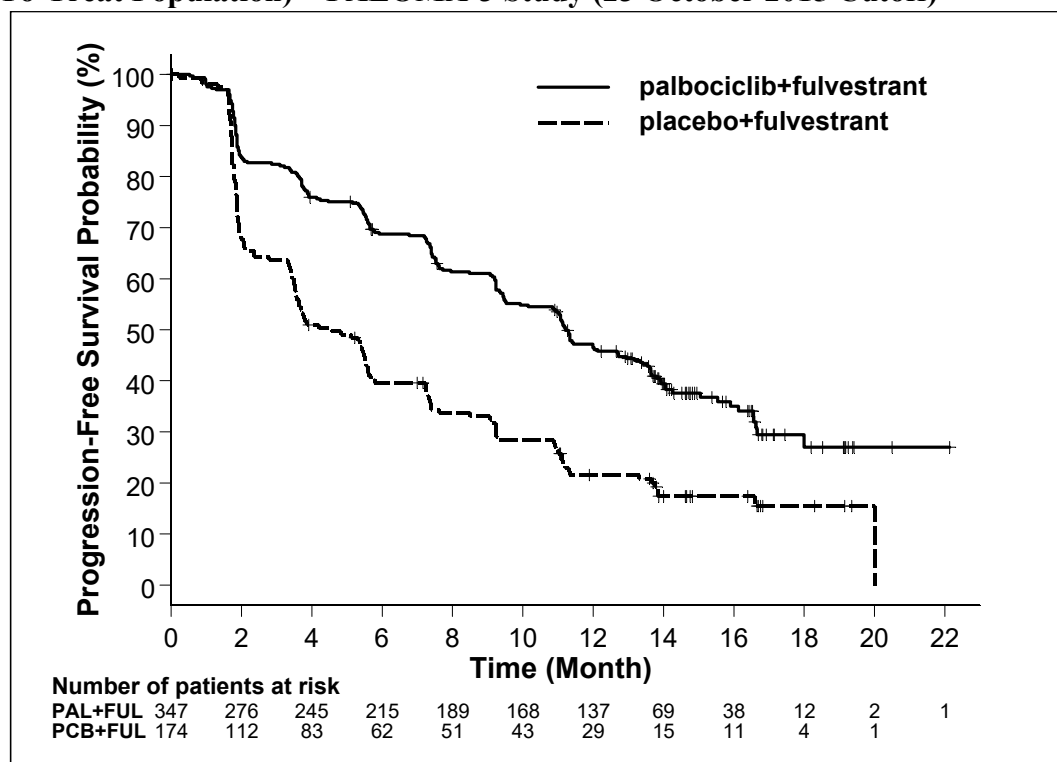
CBR=clinical benefit response; CI=confidence interval; N=number of patients; OR=objective response.

Secondary endpoint results are based on confirmed and unconfirmed responses according to RECIST 1.1.

\* Not statistically significant.

<sup>†</sup> 1-sided p-value from the log-rank test stratified by the presence of visceral metastases and sensitivity to prior endocrine therapy per randomisation.

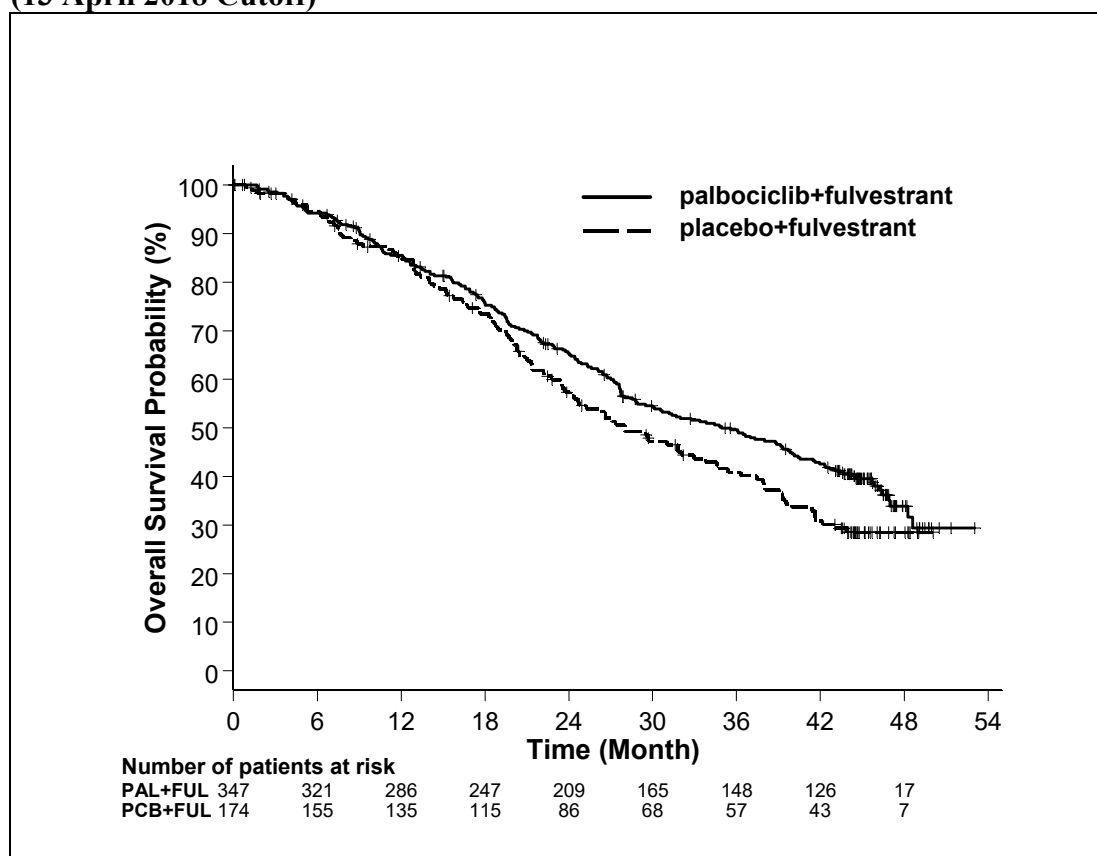
**Figure 2. Kaplan-Meier Plot of Progression-Free Survival (Investigator Assessment, Intent-To-Treat Population) – PALOMA-3 Study (23 October 2015 Cutoff)**



FUL=fulvestrant; PAL=palbociclib; PCB=placebo.

A reduction in the risk of disease progression or death in the palbociclib plus fulvestrant arm was observed in all individual patient subgroups defined by stratification factors and baseline characteristics. This was evident for pre/perimenopausal women (HR of 0.46 [95% CI: 0.28, 0.75]) and postmenopausal women (HR of 0.52 [95% CI: 0.40, 0.66]) and patients with visceral site of metastatic disease (HR of 0.50 [95% CI: 0.38, 0.65]) and non-visceral site of metastatic disease (HR of 0.48 [95% CI: 0.33, 0.71]). Benefit was also observed regardless of lines of prior therapy in the metastatic setting, whether 0 (HR of 0.59 [95% CI: 0.37, 0.93]), 1 (HR of 0.46 [95% CI: 0.32, 0.64]), 2 (HR of 0.48 [95% CI: 0.30, 0.76]), or  $\geq 3$  lines (HR of 0.59 [95% CI: 0.28, 1.22]).

**Figure 3. Kaplan-Meier Plot of Overall Survival (Intent-To-Treat Population) – PALOMA-3 Study (13 April 2018 Cutoff)**



FUL=fulvestrant; PAL=palbociclib; PCB=placebo.

Additional efficacy measures (OR and TTR) assessed in the sub-groups of patients with or without visceral disease are displayed in Table 9.

**Table 9. Efficacy Results in Visceral and Non-Visceral Disease from PALOMA–3 Study (Intent-To-Treat Population)**

|                              | Visceral disease                     |                                  | Non-visceral disease                 |                                 |
|------------------------------|--------------------------------------|----------------------------------|--------------------------------------|---------------------------------|
|                              | Palbociclib plus fulvestrant (N=206) | Placebo plus fulvestrant (N=105) | Palbociclib plus fulvestrant (N=141) | Placebo plus fulvestrant (N=69) |
| OR [% , (95% CI)]            | 35.0<br>(28.5, 41.9)                 | 13.3<br>(7.5, 21.4)              | 13.5<br>(8.3, 20.2)                  | 14.5<br>(7.2, 25.0)             |
| TTR, Median [months (range)] | 3.8<br>(3.5, 16.7)                   | 5.4<br>(3.5, 16.7)               | 3.7<br>(1.9, 13.7)                   | 3.6<br>(3.4, 3.7)               |

N=number of patients; CI=confidence interval; OR=objective response based on confirmed and unconfirmed responses according to RECIST 1.1; TTR=time to first tumour response.

Patient-reported symptoms were assessed using the European Organisation for Research and Treatment of Cancer (EORTC) quality of life questionnaire (QLQ)-C30 and its Breast Cancer Module (EORTC QLQ-BR23). A total of 335 patients in the palbociclib plus fulvestrant arm and 166 patients in the fulvestrant only arm completed the questionnaire at baseline and at least 1 postbaseline visit.

Time-to-Deterioration was prespecified as time between baseline and first occurrence of  $\geq 10$  points increase from baseline in pain symptom scores. Addition of palbociclib to fulvestrant resulted in a symptom benefit by significantly delaying time-to-deterioration in pain symptom compared with placebo plus fulvestrant (median 8.0 months versus 2.8 months; HR of 0.64 [95% CI: 0.49, 0.85];  $p < 0.001$ ).

### 5.3 Pharmacokinetic properties

The pharmacokinetics of palbociclib were characterised in patients with solid tumours including advanced breast cancer and in healthy volunteers.

#### Absorption

The mean  $C_{\max}$  of palbociclib is generally observed between 6 to 12 hours following oral administration. The mean absolute bioavailability of palbociclib after an oral 125 mg dose is 46%. In the dosing range of 25 mg to 225 mg, the area under the curve (AUC) and  $C_{\max}$  increase proportionally with dose in general. Steady-state was achieved within 8 days following repeated once daily dosing. With repeated once daily administration, palbociclib accumulates with a median accumulation ratio of 2.4 (range 1.5-4.2).

#### Food effect

Palbociclib absorption and exposure were very low in approximately 13% of the population under the fasted condition. Food intake increased the palbociclib exposure in this small subset of the population, but did not alter palbociclib exposure in the rest of the population to a clinically relevant extent. Compared to palbociclib given under overnight fasted conditions, the  $AUC_{\inf}$  and  $C_{\max}$  of palbociclib increased by 21% and 38% when given with high-fat food, by 12% and 27% when given with low-fat food, and by 13% and 24% when moderate-fat food was given 1 hour before and 2 hours after palbociclib dosing. In addition, food intake significantly reduced the intersubject and intrasubject variability of palbociclib exposure. Based on these results, palbociclib should be taken with food (see section 4.2).

#### Distribution

Binding of palbociclib to human plasma proteins *in vitro* was  $\sim 85\%$ , with no concentration dependence. The mean fraction unbound ( $f_u$ ) of palbociclib in human plasma *in vivo* increased incrementally with worsening hepatic function. There was no obvious trend in the mean palbociclib  $f_u$  in human plasma *in vivo* with worsening renal function. *In vitro*, the uptake of palbociclib into human hepatocytes occurred mainly via passive diffusion. Palbociclib is not a substrate of OATP1B1 or OATP1B3.

#### Biotransformation

*In vitro* and *in vivo* studies indicate that palbociclib undergoes extensive hepatic metabolism in humans. Following oral administration of a single 125 mg dose of [ $^{14}\text{C}$ ]palbociclib to humans, the major primary metabolic pathways for palbociclib involved oxidation and sulphonation, with

acylation and glucuronidation contributing as minor pathways. Palbociclib was the major circulating drug-derived entity in plasma.

The majority of the material was excreted as metabolites. In faeces, the sulfamic acid conjugate of palbociclib was the major drug-related component, accounting for 25.8% of the administered dose. *In vitro* studies with human hepatocytes, liver cytosolic and S9 fractions, and recombinant sulphotransferase (SULT) enzymes indicated that CYP3A and SULT2A1 are mainly involved in the metabolism of palbociclib.

### Elimination

The geometric mean apparent oral clearance (CL/F) of palbociclib was 63 L/h, and the mean plasma elimination half-life was 28.8 hours in patients with advanced breast cancer. In 6 healthy male subjects given a single oral dose of [<sup>14</sup>C]palbociclib, a median of 92% of the total administered radioactive dose was recovered in 15 days; faeces (74% of dose) was the major route of excretion, with 17% of the dose recovered in urine. Excretion of unchanged palbociclib in faeces and urine was 2% and 7% of the administered dose, respectively.

*In vitro*, palbociclib is not an inhibitor of CYP1A2, 2A6, 2B6, 2C8, 2C9, 2C19, and 2D6, and is not an inducer of CYP1A2, 2B6, 2C8, and 3A4 at clinically relevant concentrations.

*In vitro* evaluations indicate that palbociclib has low potential to inhibit the activities of organic anion transporter (OAT)1, OAT3, organic cation transporter (OCT)2, organic anion transporting polypeptide (OATP)1B1, OATP1B3, and bile salt export pump (BSEP) at clinically relevant concentrations.

### Special populations

#### *Age, Gender, and Body Weight*

Based on a population pharmacokinetic analysis in 183 patients with cancer (50 male and 133 female patients, age ranging from 22 to 89 years, and body weight ranging from 38 to 123 kg), gender had no effect on the exposure of palbociclib, and age and body weight had no clinically important effect on the exposure of palbociclib.

#### *Paediatric Population*

Pharmacokinetics of palbociclib has not been evaluated in patients <18 years of age.

### *Hepatic impairment*

Data from a pharmacokinetic study in subjects with varying degrees of hepatic function indicate that palbociclib unbound exposure (unbound  $AUC_{inf}$ ) decreased by 17% in subjects with mild hepatic impairment (Child-Pugh class A), and increased by 34% and 77% in subjects with moderate (Child-Pugh class B) and severe (Child-Pugh class C) hepatic impairment, respectively, relative to subjects with normal hepatic function. Peak palbociclib unbound exposure (unbound  $C_{max}$ ) was increased by 7%, 38% and 72% for mild, moderate and severe hepatic impairment, respectively, relative to subjects with normal hepatic function. In addition, based on a population pharmacokinetic analysis that included 183 patients with advanced cancer, where 40 patients had mild hepatic impairment based on National Cancer Institute (NCI) classification (total bilirubin  $\leq$  Upper Limit of Normal (ULN) and Aspartate Aminotransferase (AST)  $>$ ULN, or total bilirubin  $>1.0$  to  $1.5 \times$  ULN and any AST), mild hepatic impairment had no effect on the pharmacokinetics of palbociclib.

### *Renal impairment*

Data from a pharmacokinetic study in subjects with varying degrees of renal function indicate that total palbociclib exposure ( $AUC_{inf}$ ) increased by 39%, 42%, and 31% with mild ( $60 \text{ mL/min} \leq \text{CrCl} < 90 \text{ mL/min}$ ), moderate ( $30 \text{ mL/min} \leq \text{CrCl} < 60 \text{ mL/min}$ ), and severe ( $\text{CrCl} < 30 \text{ mL/min}$ ) renal impairment, respectively, relative to subjects with normal ( $\text{CrCl} \geq 90 \text{ mL/min}$ ) renal function. Peak palbociclib exposure ( $C_{max}$ ) was increased by 17%, 12%, and 15% for mild, moderate, and severe renal impairment, respectively, relative to subjects with normal renal function. In addition, based on a population pharmacokinetic analysis that included 183 patients with advanced cancer, where 73 patients had mild renal impairment and 29 patients had moderate renal impairment, mild and moderate renal impairment had no effect on the pharmacokinetics of palbociclib. The pharmacokinetics of palbociclib have not been studied in patients requiring haemodialysis.

### *Ethnicity*

In a pharmacokinetic study in healthy volunteers, palbociclib  $AUC_{inf}$  and  $C_{max}$  values were 30% and 35% higher, respectively, in Japanese subjects compared with non-Asian subjects after a single oral dose. However, this finding was not reproduced consistently in subsequent studies in Japanese or Asian breast cancer patients after multiple dosing. Based on an analysis of the cumulative pharmacokinetic, safety and efficacy data across Asian and non-Asian populations, no dose adjustment based on Asian race is considered necessary.

## **6. NONCLINICAL PROPERTIES**

### **6.1 Animal Toxicology or Pharmacology**

The primary target organ findings following single and/or repeat dosing included haematolymphopoietic and male reproductive organ effects in rats and dogs, and effects on bone and actively growing incisors in rats only. These systemic toxicities were generally observed at clinically relevant exposures based on AUC. Partial to full reversal of effects on the haematolymphopoietic, male reproductive systems, and incisor teeth were established, whereas the bone effect was not reversed following a 12-week nondosing period. In addition, cardiovascular effects (QTc prolongation, decreased heart rate, and increased RR interval and systolic blood pressure) were identified in telemetered dogs at  $\geq 4$  times human clinical exposure based on  $C_{max}$ .



### Carcinogenicity

Palbociclib was assessed for carcinogenicity in a 6-month transgenic mouse study and in a 2-year rat study. Palbociclib was negative for carcinogenicity in transgenic mice at doses up to 60 mg/kg/day (No Observed Effect Level [NOEL] approximately 11 times human clinical exposure based on AUC). Palbociclib-related neoplastic finding in rats included an increased incidence of microglial cell tumours in the central nervous system of males at 30 mg/kg/day; there were no neoplastic findings in female rats at any dose up to 200 mg/kg/day. The NOEL for palbociclib-related carcinogenicity effects was 10 mg/kg/day (approximately 2 times the human clinical exposure based on AUC) and 200 mg/kg/day (approximately 4 times the human clinical exposure based on AUC) in males and females, respectively. The relevance of the male rat neoplastic finding to humans is unknown.

### Genotoxicity

Palbociclib was not mutagenic in a bacterial reverse mutation (Ames) assay and did not induce structural chromosomal aberrations in the *in vitro* human lymphocyte chromosome aberration assay.

Palbociclib induced micronuclei via an aneugenic mechanism in Chinese Hamster Ovary cells *in vitro* and in the bone marrow of male rats at doses  $\geq 100$  mg/kg/day. The exposure of animals at the no observed effect level for aneugenecity was approximately 7 times human clinical exposure based on AUC.

### Impairment of fertility

Palbociclib did not affect mating or fertility in female rats at any dose tested up to 300 mg/kg/day (approximately 3 times human clinical exposure based on AUC), and no adverse effects were observed in female reproductive tissues in repeat-dose toxicity studies up to 300 mg/kg/day in the rat and 3 mg/kg/day in the dog (approximately 5 and 3 times human clinical exposure based on AUC, respectively).

Palbociclib is considered to have the potential to impair reproductive function and fertility in male humans based on non-clinical findings in rats and dogs. Palbociclib-related findings in the testis, epididymis, prostate, and seminal vesicle included decreased organ weight, atrophy or degeneration, hypospermia, intratubular cellular debris, lower sperm motility and density, and decreased secretion. These findings were observed in rats and/or dogs at exposures  $\geq 9$  times or subtherapeutic compared to human clinical exposure based on AUC, respectively. Partial reversibility of male reproductive organ effects was observed in the rat and dog following a 4- and 12-week non-dosing period, respectively. Despite these male reproductive organ findings, there were no effects on mating or fertility in male rats at projected exposure levels 13 times human clinical exposure based on AUC.



## Developmental toxicity

Palbociclib is a reversible inhibitor of cyclin-dependent kinases 4 and 6, which are both involved in regulating the cell cycle. It may therefore have risk of foetal harm if used during pregnancy. Palbociclib was foetotoxic in pregnant animals. An increased incidence of a skeletal variation (increased incidence of a rib present at the seventh cervical vertebra) at  $\geq 100$  mg/kg/day was observed in rats. Reduced foetal body weights were observed at a maternally toxic dose of 300 mg/kg/day in rats (3 times human clinical exposure based on AUC), and an increased incidence of skeletal variations, including small phalanges in the forelimb was observed at a maternally toxic dose of 20 mg/kg/day in rabbits (4 times human clinical exposure based on AUC). Actual foetal exposure and cross-placenta transfer have not been examined.

## **7. DESCRIPTION**

75 mg: Size #2, opaque, hard capsule, with a light orange body color (printed “PBC 75” in white) and a light orange cap color (printed “Pfizer” in white). The capsule contains an off-white to yellow powder.

100 mg: Size #1, opaque, hard capsule, with a light orange body color (printed “PBC 100” in white) and a caramel cap color (printed “Pfizer” in white). The capsule contains an off-white to yellow powder.

125 mg: Size #0, opaque, hard capsule, with a caramel body color (printed “PBC 125” in white) and a caramel cap color (printed “Pfizer” in white). The capsule contains an off-white to yellow powder.

## **8. PHARMACEUTICAL PARTICULARS**

### **8.1. Incompatibilities**

Not applicable

### **8.2. Shelf-life**

36 months

### **8.3. Packaging information**

21 capsules in high-density polyethylene (HDPE) bottles with polypropylene (PP) closures and heat induction seal liners.

07 capsules per blister pack of Polyvinyl Chloride (PVC)/PCTFE/PVC films with aluminium foil lidding; 1 blister per carton.

07 capsules per blister pack of Polyvinyl Chloride (PVC)/PCTFE/PVC films with aluminium foil lidding; 3 blisters per carton.

## 8.4. Storage and handling instructions

Store below 30°C in the original package.  
No special requirements for handling.

## 9. PATIENT COUNSELLING INFORMATION

### Infections

- Advise patients to immediately report any signs or symptoms of myelosuppression or infection, such as fever, chills, dizziness, shortness of breath, weakness, or any increased tendency to bleed and/or to bruise (See Section 4.4 Special warnings and precautions for use).

### Interstitial Lung Disease/Pneumonitis

- Advise patients to immediately report new or worsening respiratory symptoms (See Section 4.4 Special warnings and precautions for use).

### Drug Interactions

- Grapefruit may interact with PALBACE. Patients should not consume grapefruit products while on treatment with PALBACE (see Section 4.5. Drug Interactions)
- Inform patients to avoid strong CYP3A inhibitors and strong CYP3A inducers.
- Advise patients to inform their healthcare providers of all concomitant medications, including prescription medicines, over-the-counter drugs, vitamins, and herbal products (see Section 4.5. Drug Interactions)

### Dosing and Administration

- Advise patients to take PALBACE with food.
- If the patient vomits or misses a dose, an additional dose should not be taken. The next prescribed dose should be taken at the usual time. PALBACE capsules should be swallowed whole (do not chew, crush, or open them prior to swallowing). No capsule should be ingested if it is broken, cracked, or otherwise not intact.
- Pre/perimenopausal women treated with PALBACE should also be treated with LHRH agonists (see Section 4.2. Posology and method of administration).

### Pregnancy, Lactation, and Infertility

- Embryo-Fetal Toxicity
  - Advise females of reproductive potential of the potential risk to a fetus and to use effective contraception during treatment with PALBACE therapy and for at least 3 weeks after the last dose. Advise females to inform their healthcare provider of a known or suspected pregnancy (See Section 4.4 Special warnings and precautions for use and Section 4.6. Use in special population).
  - Advise male patients with female partners of reproductive potential to use effective contraception during treatment with PALBACE and for at least 3 months after the last dose (See Section 4.6. Use in special population)
- Lactation: Advise women not to breastfeed during treatment with PALBACE and for 3 weeks after the last dose (See Section 4.6. Use in special population)

- Infertility: Inform males of reproductive potential that PALBACE may cause infertility and to consider sperm preservation before taking PALBACE (See Section 4.6. Use in special population)

## **10. DETAILS OF MANUFACTURER**

M/s. Pfizer Manufacturing Deutschland GmbH Betriebsstatte Freiburg; Mooswaldallee 1 Freiburg - 79090 NA (Germany).

### **Imported and Marketed in India by:**

Pfizer Products India Private Limited, The Capital- B Wing, 1802, 18<sup>th</sup> Floor, Plot No. C-70, G Block, Bandra Kurla Complex, Bandra (East), Mumbai 400 051, India.

## **11. DETAILS OF PERMISSION OR LICENCE NUMBER WITH DATE**

IMP-ND-128-2016 dated 11 Aug 2016, subsequent approval IMP/FF/SND/293/2017 dated 30 Dec 2017 and IMP/SND/21/000062 dated 06-Aug-2021.

## **12. DATE OF REVISION**

June 2023