1. NAME OF THE MEDICINAL PRODUCT

ALVOCEVA 25 mg tablets
ALVOCEVA 50 mg tablets
ALVOCEVA 100 mg tablets
ALVOCEVA 150 mg tablets

Not all presentations are available.

2. QUALITATIVE AND QUANTITATIVE COMPOSITION

Each film-coated tablet contains 25 mg erlotinib (as erlotinib hydrochloride).
Each film-coated tablet contains 50 mg erlotinib (as erlotinib hydrochloride).
Each film-coated tablet contains 100 mg erlotinib (as erlotinib hydrochloride).
Each film-coated tablet contains 150 mg erlotinib (as erlotinib hydrochloride).

Excipient with known effect:
Each 25 mg film-coated tablet contains 23.98 mg lactose monohydrate.
Each 50 mg film-coated tablet contains 47.97 mg lactose monohydrate.
Each 100 mg film-coated tablet contains 95.93 mg lactose monohydrate.
Each 150 mg film-coated tablet contains 143.90 mg lactose monohydrate.

For the full list of excipients, see section 6.1.

3. PHARMACEUTICAL FORM

Film-coated tablet (tablet).

White to yellowish, round biconvex, film-coated tablet, engraved with “25” on one side. The diameter of the tablet is 6.1 mm±5%.
White to yellowish, round biconvex, film-coated tablet, engraved with “50” on one side. The diameter of the tablet is 7.6 mm±5%.
White to yellowish, round biconvex, film-coated tablet, engraved with “100” on one side. The diameter of the tablet is 8.9 mm±5%.
White to yellowish, round biconvex, film-coated tablet, engraved with “150” on one side. The diameter of the tablet is 10.5 mm±5%.

4. CLINICAL PARTICULARS

4.1 Therapeutic indications

Non-Small Cell Lung Cancer (NSCLC):
Erlotinib is indicated for the first-line treatment of patients with locally advanced or metastatic non-small cell lung cancer (NSCLC) with EGFR activating mutations.

Erlotinib is also indicated for switch maintenance treatment in patients with locally advanced or metastatic NSCLC with EGFR activating mutations and stable disease after first-line chemotherapy.

Erlotinib is also indicated for the treatment of patients with locally advanced or metastatic non-small cell lung cancer after failure of at least one prior chemotherapy regimen.

No survival benefit or other clinically relevant effects of the treatment have been demonstrated in patients with Epidermal Growth Factor Receptor (EGFR)- negative tumours (see section 5.1).

Pancreatic cancer:
Erlotinib in combination with gemcitabine is indicated for the first-line treatment of patients with

locally advanced, unresectable or metastatic pancreatic cancer.

4.2 Posology and method of administration

Erlotinib treatment should be supervised by a physician experienced in the use of anti-cancer therapies.

Posology

General

Non-Small Cell Lung Cancer
EGFR mutation testing should be performed prior to initiation of erlotinib as first-line or maintenance therapy in-patients with locally advanced or metastatic NSCLC.
The recommended daily dose of erlotinib is 150 mg taken at least one hour before or two hours after the ingestion of food.

Pancreatic cancer
The recommended daily dose of erlotinib is 100 mg taken at least one hour before or two hours after the ingestion of food, in combination with gemcitabine (see the summary of product characteristics of gemcitabine for the pancreatic cancer indication).

Special Dosage Instructions
Drug Interactions: Concomitant use of CYP 3A4 substrates and modulators may require dose adjustment

Hepatic impairment
Erlotinib is eliminated by hepatic metabolism and biliary excretion. Although erlotinib exposure was similar in patients with moderately impaired hepatic function (Child-Pugh score 7-9) compared with patients with adequate hepatic function, caution should be used when administering erlotinib to patients with hepatic impairment. Dose reduction or interruption of erlotinib should be considered if severe adverse reactions occur. Safety and efficacy have not been studied in patients with severe hepatic impairment (see section 4.4 and 5.2).

Smokers: Cigarette smoking has been shown to reduce erlotinib exposure by 50-60%. The maximum tolerated dose of erlotinib in NSCLC patients who currently smoke cigarettes was 300 mg. The 300 mg dose did not show improved efficacy in second line treatment after failure of chemotherapy compared to the recommended 150 mg dose in patients who continue to smoke cigarettes (see section 4.5 and section 5.2).

Renal impairment
The safety and efficacy of erlotinib has not been studied in patients with renal impairment (see section 5.2). Based on pharmacokinetic data, no dose adjustments appear necessary in patients with mild or moderate renal impairment. Use of erlotinib in patients with severe renal impairment is not recommended.

Paediatric population
The safety and efficacy of erlotinib, in the approved indications has not been established in patients under the age of 18 years.
When dose adjustment is necessary, it is recommended to reduce in 50 mg steps (see section 4.4).

Method of administration
For oral use.

4.3 Contraindications

Hypersensitivity to erlotinib or to any of the excipients listed in section 6.1.

4.4 Special warnings and precautions for use

Assessment of EGFR mutation status
When considering the use of erlotinib as a first line or maintenance treatment for locally advanced or metastatic NSCLC, it is important that the EGFR mutation status of a patient is determined.
A validated, robust, reliable and sensitive test with a prespecified positivity threshold and demonstrated utility for the determination of EGFR mutation status, using either tumor DNA derived from a tissue sample or circulating free DNA (cfDNA) obtained from a blood (plasma) sample, should be performed according to local medical practice.
If a plasma-based cfDNA test is used and the result is negative for activating mutations, perform a tissue test wherever possible due to the potential for false negative results from a plasma-based test.

Smokers
Current smokers should be advised to stop smoking, as plasma concentrations of erlotinib in smokers as compared to non-smokers are reduced. The degree of reduction is likely to be clinically significant (see section 4.5).

Interstitial Lung Disease
Cases of interstitial lung disease (ILD)-like events, including fatalities, have been reported uncommonly in patients receiving erlotinib for treatment of non-small cell lung cancer (NSCLC), pancreatic cancer or other advanced solid tumours. In the pivotal study BR.21 in NSCLC, the incidence of ILD (0.8%) was the same in both the placebo and erlotinib groups. In a meta-analysis of NSCLC randomized controlled clinical trials (excluding phase I and single-arm phase II studies due to lack of control groups), the incidence of ILD-like events was 0.9% on erlotinib compared to 0.4% in patients in the control arms. In the pancreatic cancer study in combination with gemcitabine, the incidence of ILD-like events was 2.5% in the erlotinib plus gemcitabine group versus 0.4% in the placebo plus gemcitabine treated group. Reported diagnoses in patients suspected of having ILD-like events included pneumonitis, radiation pneumonitis, hypersensitivity pneumonitis, interstitial pneumonia, interstitial lung disease, obliterative bronchiolitis, pulmonary fibrosis, Acute Respiratory Distress Syndrome (ARDS), alveolitis, and lung infiltration. Symptoms started from a few days to several months after initiating erlotinib therapy. Confounding or contributing factors such as concomitant or prior chemotherapy, prior radiotherapy, pre-existing parenchymal lung disease, metastatic lung disease, or pulmonary infections were frequent. A higher incidence of ILD (approximately 5% with a mortality rate of 1.5%) is seen among patients in studies conducted in Japan.

In patients who develop acute onset of new and/or progressive unexplained pulmonary symptoms such as dyspnoea, cough and fever, erlotinib therapy should be interrupted pending diagnostic evaluation. Patients treated concurrently with erlotinib and gemcitabine should be monitored carefully for the possibility to develop ILD-like toxicity. If ILD is diagnosed, erlotinib should be discontinued and appropriate treatment initiated as necessary (see section 4.8).

Diarrhoea, dehydration, electrolyte imbalance and renal failure
Diarrhoea (including very rare cases with a fatal outcome) has occurred in approximately 50% of patients on erlotinib and moderate or severe diarrhoea should be treated with e.g. loperamide. In some cases dose reduction may be necessary. In the clinical studies doses were reduced by 50 mg steps. Dose reductions by 25 mg steps have not been investigated. In the event of severe or persistent diarrhoea, nausea, anorexia, or vomiting associated with dehydration, erlotinib therapy should be interrupted and appropriate measures should be taken to treat the dehydration (see section 4.8). There have been rare reports of hypokalaemia and renal failure (including fatalities). Some cases were secondary to severe dehydration due to diarrhoea, vomiting and/or anorexia, while others were confounded by concomitant chemotherapy. In more severe or persistent cases of diarrhoea, or cases leading to dehydration, particularly in groups of patients with aggravating risk factors (especially concomitant chemotherapy and other medications, symptoms or diseases or other predisposing conditions including advanced age), erlotinib therapy should be interrupted and appropriate measures should be taken to intensively rehydrate the patients intravenously. In addition, renal function and serum electrolytes including potassium should be monitored in patients at risk of dehydration.

Hepatitis, hepatic failure
Rare cases of hepatic failure (including fatalities) have been reported during use of erlotinib.

Confounding factors have included pre-existing liver disease or concomitant hepatotoxic medications. Therefore, in such patients, periodic liver function testing should be considered. erlotinib dosing should be interrupted if changes in liver function are severe (see section 4.8). erlotinib is not recommended for use in patients with severe hepatic dysfunction.

Gastrointestinal perforation
Patients receiving erlotinib are at increased risk of developing gastrointestinal perforation, which was observed uncommonly (including some cases with a fatal outcome). Patients receiving concomitant anti-angiogenic agents, corticosteroids, NSAIDs, and/or taxane based chemotherapy, or who have prior history of peptic ulceration or diverticular disease are at increased risk. erlotinib should be permanently discontinued in patients who develop gastrointestinal perforation (see section 4.8).

Bullous and exfoliative skin disorders
Bullous, blistering and exfoliative skin conditions have been reported, including very rare cases suggestive of Stevens-Johnson syndrome/Toxic epidermal necrolysis, which in some cases were fatal (see section 4.8). erlotinib treatment should be interrupted or discontinued if the patient develops severe bullous, blistering or exfoliating conditions. Patients with bullous and exfoliative skin disorders should be tested for skin infection and treated according to local management guidelines.

Ocular disorders
Patients presenting with signs and symptoms suggestive of keratitis such as acute or worsening: eye inflammation, lacrimation, light sensitivity, blurred vision, eye pain and/or red eye should be referred promptly to an ophthalmology specialist. If a diagnosis of ulcerative keratitis is confirmed, treatment with erlotinib should be interrupted or discontinued. If keratitis is diagnosed, the benefits and risks of continuing treatment should be carefully considered. erlotinib should be used with caution in patients with a history of keratitis, ulcerative keratitis or severe dry eye. Contact lens use is also a risk factor for keratitis and ulceration. Very rare cases of corneal perforation or ulceration have been reported during use of erlotinib (see section 4.8).

Interactions with other medicinal products
Potent inducers of CYP3A4 may reduce the efficacy of erlotinib whereas potent inhibitors of CYP3A4 may lead to increased toxicity. Concomitant treatment with these types of agents should be avoided (see section 4.5).

Other forms of interactions
Erlotinib is characterised by a decrease in solubility at pH above 5. Medicinal products that alter the pH of the upper Gastro-Intestinal (GI) tract, like proton pump inhibitors, H2 antagonists and antacids, may alter the solubility of erlotinib and hence its bioavailability. Increasing the dose of erlotinib when co-administered with such agents is not likely to compensate for the loss of exposure. Combination of erlotinib with proton pump inhibitors should be avoided. The effects of concomitant administration of erlotinib with H2 antagonists and antacids are unknown; however, reduced bioavailability is likely. Therefore, concomitant administration of these combinations should be avoided (see section 4.5). If the use of antacids is considered necessary during treatment with erlotinib, they should be taken at least 4 hours before or 2 hours after the daily dose of erlotinib.

Excipients
The tablets contain lactose and should not be administered to patients with rare hereditary problems of galactose intolerance, total lactase deficiency or glucose-galactose malabsorption.
This medicine contains less than 1 mmol sodium (23 mg) per tablet, that is to say essentially ‘sodium-free’.

4.5 Interaction with other medicinal products and other forms of interaction

Interaction studies have only been performed in adults.

Erlotinib and other CYP substrates
Erlotinib is a potent inhibitor of CYP1A1, and a moderate inhibitor of CYP3A4 and CYP2C8, as well as a strong inhibitor of glucuronidation by UGT1A1 *in vitro.*

The physiological relevance of the strong inhibition of CYP1A1 is unknown due to the very limited expression of CYP1A1 in human tissues.

When erlotinib was co-administered with ciprofloxacin, a moderate CYP1A2 inhibitor, the erlotinib exposure [AUC] increased significantly by 39%, while no statistically significant change in C_{max} was found. Similarly, the exposure to the active metabolite increased by about 60% and 48% for AUC and C_{max}, respectively. The clinical relevance of this increase has not been established. Caution should be exercised when ciprofloxacin or potent CYP1A2 inhibitors (e.g. fluvoxamine) are combined with erlotinib. If adverse reactions related to erlotinib are observed, the dose of erlotinib may be reduced.

Pre-treatment or co-administration of erlotinib did not alter the clearance of the prototypical CYP3A4 substrates, midazolam and erythromycin, but did appear to decrease the oral bioavailability of midazolam by up to 24%. In another clinical study, erlotinib was shown not to affect pharmacokinetics of the concomitantly administered CYP3A4/2C8 substrate paclitaxel. Significant interactions with the clearance of other CYP3A4 substrates are therefore unlikely.

The inhibition of glucuronidation may cause interactions with medicinal products which are substrates of UGT1A1 and exclusively cleared by this pathway. Patients with low expression levels of UGT1A1 or genetic glucuronidation disorders (e.g. Gilbert's disease) may exhibit increased serum concentrations of bilirubin and must be treated with caution.

Erlotinib is metabolised in the liver by the hepatic cytochromes in humans, primarily CYP3A4 and to a lesser extent by CYP1A2. Extrahepatic metabolism by CYP3A4 in intestine, CYP1A1 in lung, and CYP1B1 in tumour tissue also potentially contribute to the metabolic clearance of erlotinib. Potential interactions may occur with active substances which are metabolised by, or are inhibitors or inducers of, these enzymes.

Potent inhibitors of CYP3A4 activity decrease erlotinib metabolism and increase erlotinib plasma concentrations. In a clinical study, the concomitant use of erlotinib with ketoconazole (200 mg orally twice daily for 5 days), a potent CYP3A4 inhibitor, resulted in an increase of erlotinib exposure (86% of AUC and 69% of C_{max}). Therefore, caution should be used when erlotinib is combined with a potent CYP3A4 inhibitor, e.g. azole antifungals (i.e. ketoconazole, itraconazole, voriconazole), protease inhibitors, erythromycin or clarithromycin. If necessary the dose of erlotinib should be reduced, particularly if toxicity is observed.

Potent inducers of CYP3A4 activity increase erlotinib metabolism and significantly decrease erlotinib plasma concentrations. In a clinical study, the concomitant use of erlotinib and rifampicin (600 mg orally once daily for 7 days), a potent CYP3A4 inducer, resulted in a 69% decrease in the median erlotinib AUC. Co-administration of rifampicin with a single 450 mg dose of erlotinib resulted in a mean erlotinib exposure (AUC) of 57.5% of that after a single 150 mg erlotinib dose in the absence of rifampicin treatment. Co-administration of erlotinib with CYP3A4 inducers should therefore be avoided. For patients who require concomitant treatment with erlotinib and a potent CYP3A4 inducer such as rifampicin an increase in dose to 300 mg should be considered while their safety (including renal and liver functions and serum electrolytes) is closely monitored, and if well tolerated for more than 2 weeks, further increase to 450 mg could be considered with close safety monitoring. Reduced exposure may also occur with other inducers e.g. phenytoin, carbamazepine, barbiturates or St. John's Wort (*Hypericum perforatum*). Caution should be observed when these active substances are combined with erlotinib. Alternate treatments lacking potent CYP3A4 inducing activity should be considered when possible.

<u>Erlotinib and coumarin-derived anticoagulants</u>
Interaction with coumarin-derived anticoagulants including warfarin leading to increased International Normalized Ratio (INR) and bleeding events, which in some cases were fatal, have been reported in patients receiving erlotinib. Patients taking coumarin-derived anticoagulants should be monitored regularly for any changes in prothrombin time or INR.

<u>Erlotinib and statins</u>
The combination of erlotinib and a statin may increase the potential for statin-induced myopathy,

including rhabdomyolysis, which was observed rarely.

Erlotinib and smokers
Results of a pharmacokinetic interaction study indicated a significant 2.8-, 1.5- and 9-fold reduced AUC_{inf}, C_{max} and plasma concentration at 24 hours, respectively, after administration of erlotinib in smokers as compared to non-smokers (see section 5.2). Therefore, patients who are still smoking should be encouraged to stop smoking as early as possible before initiation of treatment with erlotinib, as plasma erlotinib concentrations are reduced otherwise. The clinical effect of the decreased exposure has not been formally assessed but it is likely to be clinically significant.

Erlotinib and P-glycoprotein inhibitors
Erlotinib is a substrate for the P-glycoprotein active substance transporter. Concomitant administration of inhibitors of Pgp, e.g. cyclosporine and verapamil, may lead to altered distribution and/or altered elimination of erlotinib. The consequences of this interaction for e.g. CNS toxicity have not been established. Caution should be exercised in such situations.

Erlotinib and medicinal products altering pH
Erlotinib is characterised by a decrease in solubility at pH above 5. Medicinal products that alter the pH of the upper Gastro-Intestinal (GI) tract may alter the solubility of erlotinib and hence its bioavailability. Co-administration of erlotinib with omeprazole, a proton pump inhibitor (PPI), decreased the erlotinib exposure [AUC] and maximum concentration [C_{max}] by 46% and 61%, respectively. There was no change to T_{max} or half-life. Concomitant administration of erlotinib with 300 mg ranitidine, an H2-receptor antagonist, decreased erlotinib exposure [AUC] and maximum concentrations [C_{max}] by 33% and 54%, respectively. Increasing the dose of erlotinib when co-administered with such agents is not likely to compensate for this loss of exposure. However, when erlotinib was dosed in a staggered manner 2 hours before or 10 hours after ranitidine 150 mg b.i.d., erlotinib exposure [AUC] and maximum concentrations [C_{max}] decreased only by 15% and 17%, respectively. The effect of antacids on the absorption of erlotinib has not been investigated but absorption may be impaired, leading to lower plasma levels. In summary, the combination of erlotinib with proton pump inhibitors should be avoided. If the use of antacids is considered necessary during treatment with erlotinib, they should be taken at least 4 hours before or 2 hours after the daily dose of erlotinib. If the use of ranitidine is considered, it should be used in a staggered manner; i.e. erlotinib must be taken at least 2 hours before or 10 hours after ranitidine dosing.

Erlotinib and Gemcitabine
In a Phase Ib study, there were no significant effects of gemcitabine on the pharmacokinetics of erlotinib nor were there significant effects of erlotinib on the pharmacokinetics of gemcitabine.

Erlotinib and Carboplatin/Paclitaxel
Erlotinib increases platinum concentrations. In a clinical study, the concomitant use of erlotinib with carboplatin and paclitaxel led to an increase of total platinum AUC_{0-48} of 10.6%. Although statistically significant, the magnitude of this difference is not considered to be clinically relevant. In clinical practice, there may be other co-factors leading to an increased exposure to carboplatin like renal impairment. There were no significant effects of carboplatin or paclitaxel on the pharmacokinetics of erlotinib.

Erlotinib and Capecitabine
Capecitabine may increase erlotinib concentrations. When erlotinib was given in combination with capecitabine, there was a statistically significant increase in erlotinib AUC and a borderline increase in C_{max} when compared with values observed in another study in which erlotinib was given as single agent. There were no significant effects of erlotinib on the pharmacokinetics of capecitabine.

Erlotinib and proteasome inhibitors
Due to the working mechanism, proteasome inhibitors including bortezomib may be expected to influence the effect of EGFR inhibitors including erlotinib. Such influence is supported by limited clinical data and preclinical studies showing EGFR degradation through the proteasome.

4.6 Fertility, pregnancy and lactation

Pregnancy
There are no adequate data for the use of erlotinib in pregnant women. Studies in animals have shown no evidence of teratogenicity or abnormal parturition. However, an adverse effect on the pregnancy cannot be excluded as rat and rabbit studies have shown increased embryo/foetal lethality, (see section 5.3). The potential risk for humans is unknown.

Women of childbearing potential
Women of childbearing potential must be advised to avoid pregnancy while on erlotinib. Adequate contraceptive methods should be used during therapy, and for at least 2 weeks after completing therapy. Treatment should only be continued in pregnant women if the potential benefit to the mother outweighs the risk to the foetus.

Breast-feeding
It is not known whether erlotinib is excreted in human milk. Because of the potential harm to the infant, mothers should be advised against breast-feeding while receiving erlotinib.

Fertility
Studies in animals have shown no evidence of impaired fertility. However, an adverse effect on the fertility cannot be excluded as animal studies have shown effects on reproductive parameters (see section 5.3). The potential risk for humans is unknown.

4.7 Effects on ability to drive and use machines

No studies on the effects on the ability to drive and use machines have been performed; however erlotinib is not associated with impairment of mental ability.

4.8 Undesirable effects

Experience from clinical trials
Safety evaluation of erlotinib is based on the data from more than 1500 patients treated with at least one 150 mg dose of erlotinib monotherapy, and more than 300 patients who received erlotinib 100 mg or 150 mg in combination with gemcitabine.

The incidence of adverse drug reactions (ADRs) reported with erlotinib alone or in combination with chemotherapy are summarized in the tables below and are based on data from clinical trials. The listed ADRs were those reported in at least 10% (in the erlotinib group) of patients and occurred more frequently (≥3%) in patients treated with erlotinib than in the comparator arm.

Adverse drug reactions from clinical trials (Table 1) are listed by MedDRA system organ class. The corresponding frequency category for each adverse drug reaction is based on the following convention: very common (≥1/10), common (≥1/100 to <1/10), uncommon (≥1/1,000 to <1/100), rare (≥1/10,000 to <1/1000), very rare (<1/10,000).

Non-small cell lung cancer (erlotinib administered as monotherapy):

First-Line Treatment of Patients with EGFR Mutations
In an open-label, randomized phase III study, ML 20650 conducted in 154 patients, the safety of erlotinib for first-line treatment of NSCLC patients with EGFR activating mutations was assessed in 75 patients; no new safety signals were observed in these patients.

The most frequent ADRs seen in patients treated with erlotinib in study ML 20650 were rash and diarrhoea (any Grade 80% and 57%, respectively), most were Grade 1/2 in severity and manageable without intervention. Grade 3 rash and diarrhoea occurred in 9% and 4% of patients, respectively. No Grade 4 rash or diarrhoea was observed. Both rash and diarrhoea resulted in discontinuation of erlotinib in 1% of patients. Dose modifications (interruptions or reductions) for rash and diarrhoea were needed in 11% and 7% of patients, respectively.

Maintenance treatment
In two other double-blind, randomized, placebo-controlled Phase III studies (BO18192 (SATURN) and BO25460 (IUNO)) conducted in a total of 1532 patients with advanced, recurrent or metastatic NSCLC following first-line standard platinum-based chemotherapy, no new safety signals were identified.
The most frequent ADRs seen in patients treated with erlotinib in studies BO18192 and BO25460 were rash (BO18192: all grades 49.2%, grade 3: 6.0%; BO25460: all grades 39.4%, grade 3: 5.0%) and diarrhoea (BO18192: all grades 20.3%, grade 3: 1.8%; BO25460: all grades 24.2%, grade 3: 2.5%). No Grade 4 rash or diarrhoea was observed in either study. Rash and diarrhoea resulted in discontinuation of erlotinib in 1% and < 1% of patients, respectively, in study BO18192, while no patient discontinued for rash or diarrhea in BO25460. Dose modifications (interruptions or reductions) for rash and diarrhoea were needed in 8.3% and 3% of patients, respectively, in study BO18192 and 5.6% and 2.8% of patients, respectively, in study BO25460.

Second and Further Line Treatment
The ADRs in Table 1 are based on data from a randomized double-blind study (BR.21) conducted in 731 patients with locally advanced or metastatic NSCLC after failure of at least one prior chemotherapy regimen. Patients were randomized 2:1 to receive erlotinib 150 mg or placebo. Study drug was taken orally once daily until disease progression or unacceptable toxicity.
The most frequent ADRs were rash and diarrhoea (any Grade 75% and 54%, respectively), most were Grade 1/2 in severity and manageable without intervention. Grade 3/4 rash and diarrhoea occurred in 9% and 6%, respectively, in patients treated with erlotinib and each resulted in study discontinuation in 1% of patients. Dose reduction for rash and diarrhea was needed in 6% and 1% of patients, respectively. In study BR.21, the median time to onset of rash was 8 days, and the median time to onset of diarrhea was 12 days.

Pancreatic cancer – erlotinib administered concurrently with gemcitabine

The ADRs listed in the table 1 below are based on erlotinib-arm data from a controlled clinical trial (PA.3), 259 patients with pancreatic cancer received erlotinib 100 mg plus gemcitabine compared to 256 patients in the placebo plus gemcitabine-arm.
The most frequent ADRs in pivotal study PA.3 in pancreatic cancer patients receiving erlotinib 100 mg plus gemcitabine were fatigue, rash and diarrhea. In the erlotinib plus gemcitabine arm, Grade 3/4 rash and diarrhea were each reported in 5% of patients. The median time to onset of rash and diarrhea was 10 days and 15 days, respectively. Rash and diarrhea each resulted in dose reductions in 2% of patients, and resulted in study discontinuation in up to 1% of patients receiving erlotinib plus gemcitabine.
The erlotinib 150 mg plus gemcitabine cohort (24 patients) was associated with a higher rate of certain class-specific adverse reactions including rash and required more frequent dose reduction or interruption.

Table 1: ADRs occurring in ³ 10% of patients in BR.21 (treated with erlotinib) and PA.3 (treated with erlotinib plus gemcitabine) studies and ADRs occurring more frequently (≥ 3%) than placebo in BR.21 (treated with erlotinib) and PA.3 (treated with erlotinib plus gemcitabine) studies

	Erlotinib (BR.21) N = 485			**Placebo (PA.3) N = 259**			**Frequency category of highest incidence**
NCI-CTC Grade	**Any Grade**	**3**	**4**	**Any Grade**	**3**	**4**	
MedDRA Preferred Term	%	%	%	%	%	%	
Infections and infestations							
Infection*	24	4	0	31	3	<1	very common
Metabolism and nutrition disorders							
Anorexia	52	8	1	-	-	-	very common
Weight decreased	-	-	-	39	2	0	very common
Eye disorders							

Conjunctivitis	12	<1	0	-	-	-	very common
Keratoconjunctivitis sicca	12	0	0	-	-	-	very common
Psychiatric disorders							
Depression	-	-	-	19	2	0	very common
Nervous system disorders							
Headache	-	-	-	15	<1	0	very common
Neuropathy	-	-	-	13	1	<1	very common
Respiratory, thoracic and mediastinal disorders							
Dyspnea	41	17	11	-	-	-	very common
Cough	33	4	0	16	0	0	very common
Gastrointestinal disorders							
Diarrhea	54	6	<1	48	5	<1	very common
Nausea	33	3	0	-	-	-	very common
Vomiting	23	2	<1	-	-	-	very common
Stomatitis	17	<1	0	22	<1	0	very common
Abdominal pain	11	2	<1	-	-	-	very common
Dyspepsia	-	-	-	17	<1	0	very common
Flatulence	-	-	-	13	0	0	very common
Skin and subcutaneous tissue disorders							
Rash	75	8	<1	69	5	0	very common
Pruritus	13	<1	0	-	-	-	very common
Dry skin	12	0	0	-	-	-	very common
Alopecia	-	-	-	14	0	0	very common
General disorders and administration site conditions							
Fatigue	52	14	4	73	14	2	very common
Pyrexia	-	-	-	36	3	0	very common
Rigors	-	-	-	12	0	0	very common

* Severe infections, with or without neutropenia, have included pneumonia, sepsis, and cellulitis.
- corresponds to percentage below threshold

In the pancreatic carcinoma trial, 10 patients in the erlotinib/ gemcitabine group developed deep venous thrombosis (incidence: 3.9%). In comparison, 3 patients in the placebo/ gemcitabine group developed deep venous thrombosis (incidence 1.2%). The overall incidence of grade 3 or 4 thrombotic events, including deep venous thrombosis, was similar in the two treatment arms: 11% for erlotinib plus gemcitabine and 9% for placebo plus gemcitabine.

Severe adverse events (≥grade 3 NCI CTC) in the erlotinib plus gemcitabine group with incidences < 5% included syncope, arrhythmias, ileus, pancreatitis, hemolytic anemia including microangiopathic hemolytic anemia with thrombocytopenia, myocardial infarction/ischemia, cerebrovascular accidents including cerebral hemorrhage, and renal insufficiency.

Further information on ADRs of special interest
The following ADRs have been observed in patients who received erlotinib 150 mg as monotherapy or 100 mg or 150 mg in combination with gemcitabine.

Very common ADR's are presented in Table 1, ADR's in other frequency categories are summarized below.

Gastrointestinal Disorders:
Gastrointestinal perforations have been reported uncommonly (in less than 1% of patients) with erlotinib treatment, in some cases with a fatal outcome (see section 2.4 Warnings and Precautions).
Cases of gastrointestinal bleeding have been reported commonly (including some fatalities), some associated with concomitant warfarin administration (See also Section 4.5), and some with concomitant NSAIDs.

Hepatobiliary Disorders:

Liver function test abnormalities (including raised ALT, AST, bilirubin) have been observed commonly in clinical trials of erlotinib. In study PA3, these occurred very commonly. They were mainly mild or moderate in severity, transient in nature or associated with liver metastases.
Rare cases of hepatic failure (including fatalities) have been reported during use of erlotinib. Confounding factors have included pre-existing liver disease or concomitant hepatotoxic medications.
In study ML20650, at the interim analysis, 7 patients out of a total of 75 patients in the erlotinib arm experienced hepatobiliary disorders, of which five patients had hyperbilirubinaemia, including one event which was considered serious (Grade 2) and assessed as probably related by the investigator. One patient with a pre-existing cholelithiasis experienced a non-serious event of worsening cholelithiasis grade 2, assessed as non-related to study drug and one patient with normal baseline liver function had a fatal event of hepatotoxicity, assessed as related to study drug by the investigator.

Eye Disorders:
Corneal ulcerations or perforations have been reported very rarely in patients receiving erlotinib treatment (see section 2.4 Warnings and Precautions). Keratitis and conjunctivitis have been reported commonly with erlotinib.
Abnormal eyelash growth including in-growing eyelashes, excessive growth and thickening of the eyelashes have been reported (see section 4.4).

Respiratory, thoracic and mediastinal disorders:
There have been uncommon reports of serious interstitial lung disease (ILD) -like events, (including fatalities), in patients receiving erlotinib for treatment of NSCLC or other advanced solid tumors. (See section 4.4).
Cases of epistaxis have also been reported commonly in both the NSCLC and the pancreatic cancer trials.

Skin and subcutaneous tissue disorders:
Rash has been reported very commonly in patients receiving erlotinib and in general, manifests as a mild or moderate erythematous and papulopustular rash, which may occur or worsen in sun exposed areas. Acne, dermatitis acneiform and folliculitis have been observed commonly, most of these events were mild or moderate and non-serious. For patients who are exposed to sun, protective clothing, and/or use of sunscreen (e.g. mineral-containing) may be advisable. Skin fissures, mostly non-serious, were reported commonly and in the majority of cases were associated with rash and dry skin. Other mild skin reactions such as hyperpigmentation have been observed uncommonly (in less than 1% of patients).
Bullous, blistering and exfoliative skin conditions have been reported, including very rare cases suggestive of Stevens-Johnson syndrome/Toxic epidermal necrolysis, which in some cases were fatal (see section 2.4 Warnings and Precautions).
Hair and nail changes, mostly non-serious, were reported in clinical trials, e.g. paronychia was reported commonly and hirsutism, eyelash/eyebrow changes and brittle and loose nails were reported uncommonly.

Post-Marketing Experience
The following adverse drug reactions have been identified from postmarketing experience with erlotinib based on spontaneous case reports and literature cases.

Table 2: Adverse drug reactions from postmarketing experience

Adverse reactions	**Frequency category**
Eye disorders Uveitis	Unknown
Skin and subcutaneous tissue disorders Hair and nail changes, mostly non-serious, e.g. hirsutism, eyelash/eyebrow changes, paronychia and brittle and loose nails	Uncommon

4.9 Overdose

Symptoms
Single oral doses of erlotinib up to 1000 mg erlotinib in healthy subjects, and up to 1600 mg in cancer patients have been tolerated. Repeated twice daily doses of 200 mg in healthy subjects were poorly

tolerated after only a few days of dosing. Based on the data from these studies, severe adverse reactions such as diarrhoea, rash and possibly increased activity of liver aminotransferases may occur above the recommended dose.

Management
In case of suspected overdose, erlotinib should be withheld and symptomatic treatment initiated.

5. PHARMACOLOGICAL PROPERTIES

5.1 Pharmacodynamic properties

Pharmacotherapeutic group: antineoplastic agent protein kinase inhibitor, ATC code: L01EB02

Mechanism of action
Erlotinib is an epidermal growth factor receptor/human epidermal growth factor receptor type 1 (EGFR also known as HER1) tyrosine kinase inhibitor. Erlotinib potently inhibits the intracellular phosphorylation of EGFR. EGFR is expressed on the cell surface of normal cells and cancer cells. In non-clinical models, inhibition of EGFR phosphotyrosine results in cell stasis and/or death.

EGFR mutations may lead to constitutive activation of anti-apoptotic and proliferation signaling pathways. The potent effectiveness of erlotinib in blocking EGFR-mediated signalling in these EGFR mutation positive tumours is attributed to the tight binding of erlotinib to the ATP-binding site in the mutated kinase domain of the EGFR. Due to the blocking of downstream-signaling, the proliferation of cells is stopped, and cell death is induced through the intrinsic apoptotic pathway. Tumour regression is observed in mouse models of enforced expression of these EGFR activating mutations.

Clinical efficacy

- First-line Non-Small Cell Lung Cancer (NSCLC) therapy for patients with EGFR activating mutations (erlotinib administered as monotherapy):

The efficacy of erlotinib in first-line treatment of patients with EGFR activating mutations in NSCLC was demonstrated in a phase III, randomized, open-label trial (ML20650, EURTAC). This study was conducted in Caucasian patients with metastatic or locally advanced NSCLC (stage IIIB and IV) who have not received previous chemotherapy or any systemic antitumour therapy for their advanced disease and who present mutations in the tyrosine kinase domain of the EGFR (exon 19 deletion or exon 21 mutation). Patients were randomized 1:1 to receive erlotinib 150 mg daily or up to 4 cycles of platinum based doublet chemotherapy.
The primary endpoint was investigator assessed PFS. The efficacy results are summarized in Table 5.

Figure 1: Kaplan-Meier curve for investigator assessed PFS in trial ML20650 (EURTAC) (April 2012 cut-off)

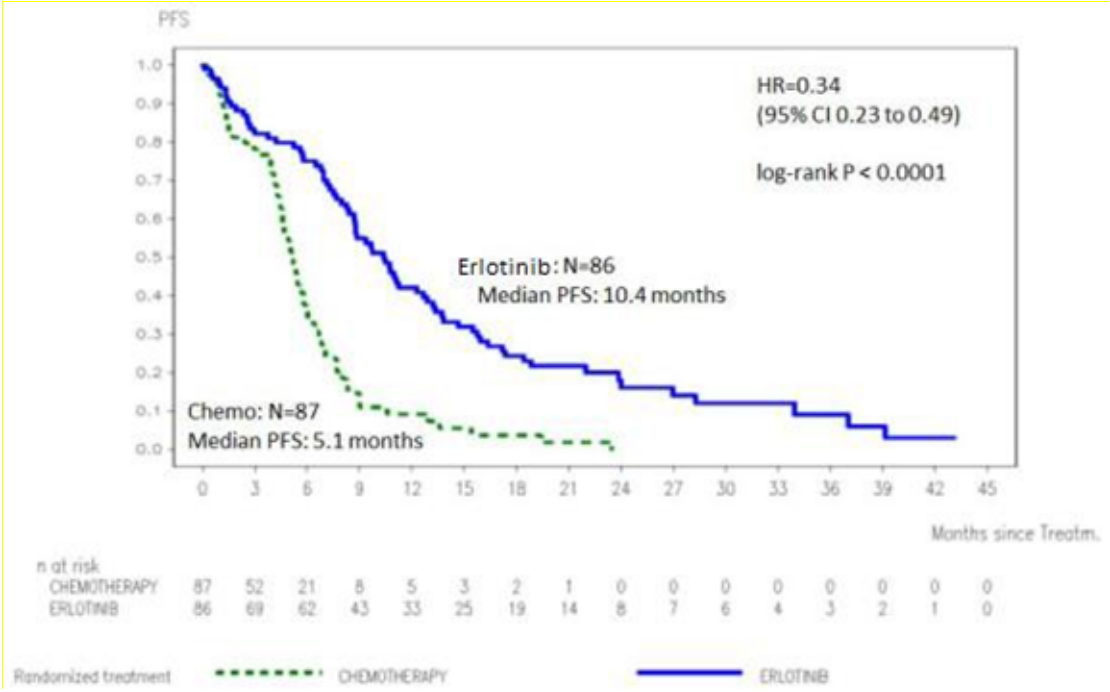


Table 5: Efficacy results of erlotinib versus chemotherapy in trial ML20650 (EURTAC)

		Erlotinib	**Chemo-therapy**	**Hazard Ratio (95% CI)**	**p-value**
Pre-planned Interim Analysis (35% OS maturity) (n=153) Cut-off date: Aug 2010		n=77	n=76		
	Primary endpoint: Progression Free Survival (PFS, median in months)* Investigator Assessed**	9.4	5.2	0.42 [0.27-0.64]	p<0.0001
	Independent Review**	10.4	5.4	0.47 [0.27-0.78]	p=0.003
	Best Overall Response Rate (CR/PR)	54.5%	10.5%		p<0.0001
	Overall Survival (OS) (months)	22.9	18.8	0.80 [0.47-1.37]	p=0.4170
Exploratory Analysis (40% OS maturity) (n=173) Cut-off date: Jan 2011		n=86	n=87		
	PFS (median in months), Investigator assessed	9.7	5.2	0.37 [0.27-0.54]	p<0.0001
	Best Overall Response Rate (CR/PR)	58.1%	14.9%		p<0.0001
	OS (months)	19.3	19.5	1.04 [0.65-1.68]	p=0.8702
Updated Analysis (62% OS maturity) (n=173) Cut-off date: April 2012		n=86	n=87		
	PFS (median in months)	10.4	5.1	0.34 [0.23-0.49]	p<0.0001
	OS*** (months)	22.9	20.8	0.93 [0.64-1.36]	p=0.7149

CR=complete response; PR=partial response
* A 58% reduction in the risk of disease progression or death was observed
** Overall concordance rate between investigator and IRC assessment was 70%
*** A high crossover was observed with 82% of the patients in the chemotherapy arm receiving subsequent therapy with an EGFR tyrosine kinase inhibitor and all but 2 of those patients had subsequent erlotinib.

- Maintenance NSCLC therapy after first-line chemotherapy (erlotinib administered as monotherapy):

The efficacy and safety of erlotinib as maintenance after first-line chemotherapy for NSCLC was investigated in a randomized, double-blind, placebo-controlled trial (BO18192, SATURN). This study was conducted in 889 patients with locally advanced or metastatic NSCLC who did not progress after 4 cycles of platinum-based doublet chemotherapy. Patients were randomized 1:1 to receive erlotinib 150 mg or placebo orally once daily until disease progression. The primary endpoint of the study included progression free survival (PFS) in all patients. Baseline demographic and disease characteristics were well balanced between the two treatment arms. Patients with ECOG PS>1, significant hepatic or renal co-morbidities were not included in the study.

In this study, the overall population showed a benefit for the primary PFS end point (HR=0.71 p<0.0001) and the secondary OS end-point (HR=0.81 p=0.0088). However the largest benefit was observed in a predefined exploratory analysis in patients with EGFR activating mutations (n=49) demonstrating a substantial PFS benefit (HR=0.10, 95% CI, 0.04 to 0.25; p<0.0001 and an overall survival HR of 0.83 (95% CI, 0.34 to 2.02). 67% of placebo patients in the EGFR mutation positive subgroup received second or further line treatment with EGFR-TKIs.
The BO25460 (IUNO) study was conducted in 643 patients with advanced NSCLC whose tumors did not harbor an EGFR-activating mutation (exon 19 deletion or exon 21 L858R mutation) and who had not experienced disease progression after four cycles of platinum-based chemotherapy.

The objective of the study was to compare the overall survival of first line maintenance therapy with erlotinib versus erlotinib administered at the time of disease progression. The study did not meet its primary endpoint. OS of erlotinib in first line maintenance was not superior to erlotinib as second line treatment in patients whose tumor did not harbor an EGFR-activating mutation (HR=1.02, 95% CI, 0.85 to 1.22, p=0.82). The secondary endpoint of PFS showed no difference between erlotinib and placebo in maintenance treatment (HR=0.94, 95 % CI, 0.80 to 1.11; p=0.48).

Based on the data from the BO25460 (IUNO) study, erlotinib use is not recommended for first-line maintenance treatment in patients without an EGFR activating mutation.

- NSCLC treatment after failure of at least one prior chemotherapy regimen (erlotinib administered as monotherapy):

The efficacy and safety of erlotinib as second/third-line therapy was demonstrated in a randomised, double-blind, placebo-controlled trial (BR.21), in 731 patients with locally advanced or metastatic NSCLC after failure of at least one chemotherapy regimen. Patients were randomised 2:1 to receive erlotinib 150 mg or placebo orally once daily. Study endpoints included overall survival, progression-free survival (PFS), response rate, duration of response, time to deterioration of lung cancer-related symptoms (cough, dyspnoea and pain), and safety. The primary endpoint was survival.

Demographic characteristics were well balanced between the two treatment groups. About two-thirds of the patients were male and approximately one-third had a baseline ECOG performance status (PS) of 2, and 9% had a baseline ECOG PS of 3. Ninety-three percent and 92% of all patients in the erlotinib and placebo groups, respectively, had received a prior platinum-containing regimen and 36% and 37% of all patients, respectively, had received a prior taxane therapy.

The adjusted hazard ratio (HR) for death in the erlotinib group relative to the placebo group was 0.73 (95% CI, 0.60 to 0.87) (p=0.001). The percent of patients alive at 12 months was 31.2% and 21.5%, for the erlotinib and placebo groups, respectively. The median overall survival was 6.7 months in the

erlotinib group (95% CI, 5.5 to 7.8 months) compared with 4.7 months in the placebo group (95% CI, 4.1 to 6.3 months).

The effect on overall survival was explored across different patient subsets. The effect of erlotinib on overall survival was similar in patients with a baseline performance status (ECOG) of 2-3 (HR=0.77, 95% CI 0.6-1.0) or 0-1 (HR=0.73, 95% CI 0.6-0.9), male (HR=0.76, 95% CI 0.6-0.9) or female patients (HR=0.80, 95% CI 0.6-1.1), patients <65 years of age (HR=0.75, 95% CI 0.6-0.9) or older patients (HR=0.79, 95% CI 0.6-1.0), patients with one prior regimen (HR=0.76, 95% CI 0.6-1.0) or more than one prior regimen (HR=0.75, 95% CI 0.6-1.0), Caucasian (HR=0.79, 95% CI 0.6-1.0) or Asian patients (HR=0.61, 95% CI 0.4-1.0), patients with adenocarcinoma (HR=0.71, 95% CI 0.6-0.9) or squamous cell carcinoma (HR=0.67, 95% CI 0.5-0.9), but not in patients with other histologies (HR 1.04, 95% CI 0.7-1.5), patients with stage IV disease at diagnosis (HR=0.92, 95% CI 0.7-1.2) or < stage IV disease at diagnosis (HR=0.65, 95% CI 0.5-0.8). Patients who never smoked had a much greater benefit from erlotinib (survival HR=0.42, 95% CI 0.28-0.64) compared with current or ex-smokers (HR=0.87, 95% CI 0.71-1.05).
In the 45% of patients with known EGFR-expression status, the hazard ratio was 0.68 (95% CI 0.49-0.94) for patients with EGFR-positive tumours and 0.93 (95% CI 0.63-1.36) for patients with EGFR-negative tumours (defined by IHC using EGFR pharmDx kit and defining EGFR-negative as less than 10% tumour cells staining). In the remaining 55% of patients with unknown EGFR- expression status, the hazard ratio was 0.77 (95% CI 0.61-0.98).

The median PFS was 9.7 weeks in the erlotinib group (95% CI, 8.4 to 12.4 weeks) compared with 8.0 weeks in the placebo group (95% CI, 7.9 to 8.1 weeks).

The objective response rate by RECIST in the erlotinib group was 8.9% (95% CI, 6.4 to 12.0). The first 330 patients were centrally assessed (response rate 6.2%); 401 patients were investigator-assessed (response rate 11.2%).
The median duration of response was 34.3 weeks, ranging from 9.7 to 57.6+ weeks. The proportion of patients who experienced complete response, partial response or stable disease was 44.0% and 27.5%, respectively, for the erlotinib and placebo groups (p=0.004).

A survival benefit of erlotinib was also observed in patients who did not achieve an objective tumour response (by RECIST). This was evidenced by a hazard ratio for death of 0.82 (95% CI, 0.68 to 0.99) among patients whose best response was stable disease or progressive disease.

Erlotinib resulted in symptom benefits by significantly prolonging time to deterioration in cough, dyspnoea and pain, versus placebo.

- Pancreatic cancer (erlotinib administered concurrently with gemcitabine in study PA.3):

The efficacy and safety of erlotinib in combination with gemcitabine as a first-line treatment was assessed in a randomised, double-blind, placebo-controlled trial in patients with locally advanced, unresectable or metastatic pancreatic cancer. Patients were randomised to receive erlotinib or placebo once daily on a continuous schedule plus gemcitabine IV (1000 mg/m^2, Cycle 1 – Days 1, 8, 15, 22, 29, 36 and 43 of an 8 week cycle; Cycle 2 and subsequent cycles – Days 1, 8 and 15 of a 4 week cycle [approved dose and schedule for pancreatic cancer, see the gemcitabine SPC]). Erlotinib or placebo was taken orally once daily until disease progression or unacceptable toxicity. The primary endpoint was overall survival.

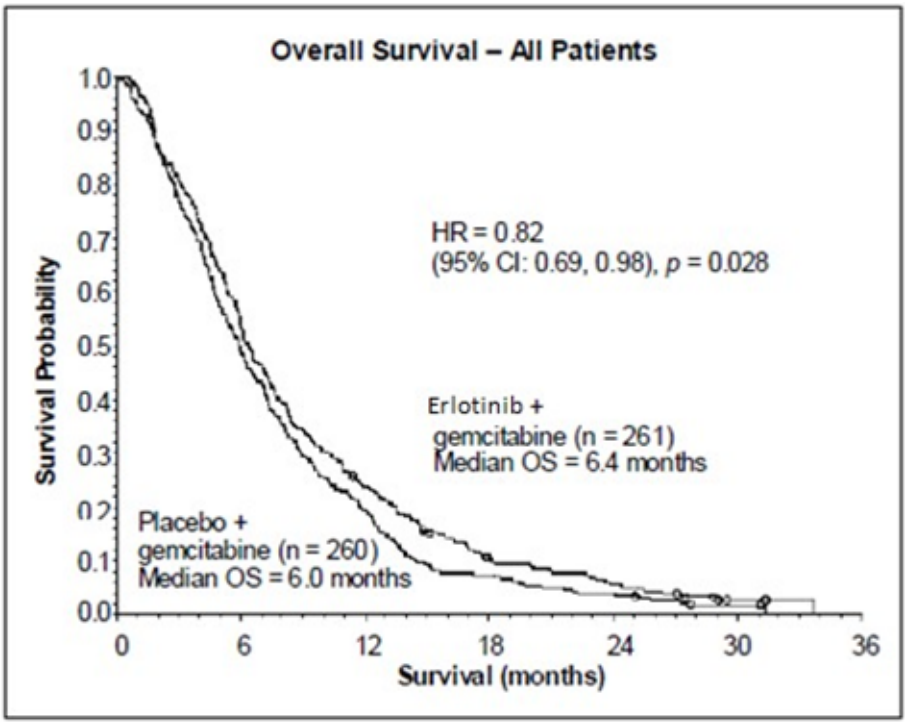
Baseline demographic and disease characteristics of the patients were similar between the 2 treatment groups, 100 mg erlotinib plus gemcitabine or placebo plus gemcitabine, except for a slightly larger proportion of females in the erlotinib/gemcitabine arm compared with the placebo/gemcitabine arm:

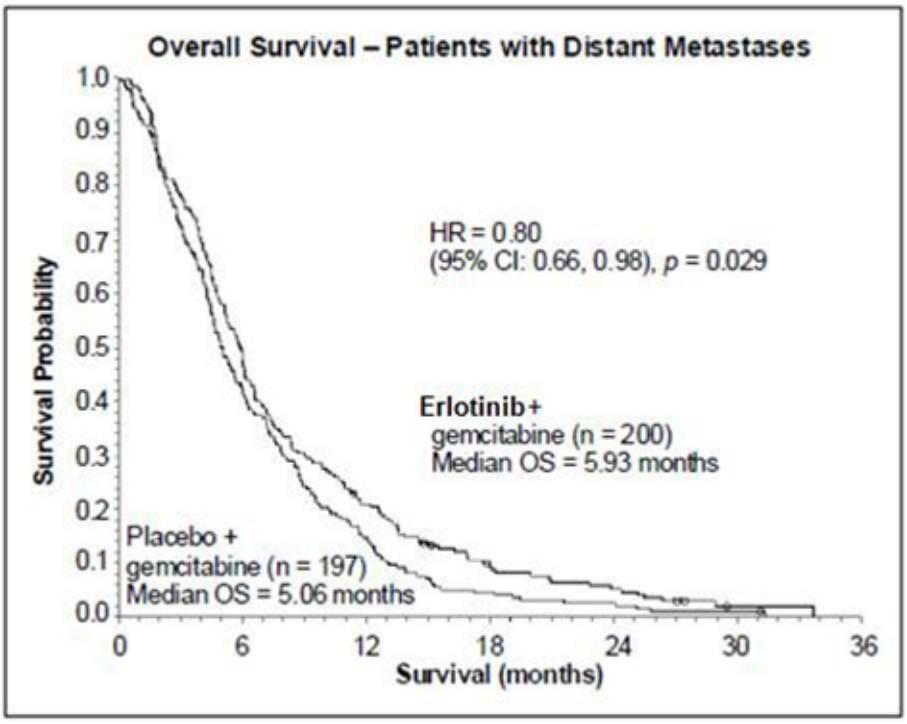
Baseline	**Erlotinib**	**Placebo**
Females	51%	44%
Baseline ECOG performance status (PS) = 0	31%	32%
Baseline ECOG performance status (PS) = 1	51%	51%

Baseline ECOG performance status (PS) = 2	17%	17%
Metastatic disease at baseline	77%	76%

Survival was evaluated in the intent-to-treat population based on follow-up survival data. Results are shown in the table below (results for the group of metastatic and locally advanced patients are derived from exploratory subgroup analysis).

Outcome	Erlotinib (months)	Placebo (months)	Δ (months)	CI of Δ	HR	CI of HR	*P*-value
Overall Population							
Median overall survival	6.4	6.0	0.41	-0.54-1.64	0.82	0.69-0.98	0.028
Mean overall survival	8.8	7.6	1.16	-0.05-2.34			
Metastatic Population							
Median overall survival	5.9	5.1	0.87	-0.26-1.56	0.80	0.66-0.98	0.029
Mean overall survival	8.1	6.7	1.43	0.17-2.66			
Locally Advanced Population							
Median overall survival	8.5	8.2	0.36	-2.43-2.96	0.93	0.65-1.35	0.713
Mean overall survival	10.7	10.5	0.19	-2.43-2.69			





In a post-hoc analysis, patients with favourable clinical status at baseline (low pain intensity, good QoL and good PS) may derive more benefit from erlotinib. The benefit is mostly driven by the presence of a low pain intensity score.

In a post-hoc analysis, patients on erlotinib who developed a rash had a longer overall survival compared to patients who did not develop rash (median OS 7.2 months vs 5 months, HR: 0.61). 90% of patients on erlotinib developed rash within the first 44 days. The median time to onset of rash was 10 days.

5.2 Pharmacokinetic properties

Absorption
After oral administration, erlotinib peak plasma levels are obtained in approximately 4 hours after oral dosing. A study in normal healthy volunteers provided an estimate of the absolute bioavailability of 59%. The exposure after an oral dose may be increased by food.

Distribution
Erlotinib has a mean apparent volume of distribution of 232 l and distributes into tumour tissue of humans. In a study of 4 patients (3 with non-small cell lung cancer [NSCLC], and 1 with laryngeal cancer) receiving 150 mg daily oral doses of erlotinib, tumour samples from surgical excisions on Day 9 of treatment revealed tumour concentrations of erlotinib that averaged 1185 ng/g of tissue. This corresponded to an overall average of 63% (range 5-161%) of the steady state observed peak plasma concentrations. The primary active metabolites were present in tumour at concentrations averaging 160 ng/g tissue, which corresponded to an overall average of 113% (range 88-130%) of the observed steady state peak plasma concentrations. Plasma protein binding is approximately 95%. Erlotinib binds to serum albumin and alpha-1 acid glycoprotein (AAG).

Biotransformation
Erlotinib is metabolised in the liver by the hepatic cytochromes in humans, primarily CYP3A4 and to a lesser extent by CYP1A2. Extrahepatic metabolism by CYP3A4 in intestine, CYP1A1 in lung, and

1B1 in tumour tissue potentially contribute to the metabolic clearance of erlotinib.

There are three main metabolic pathways identified: 1) O-demethylation of either side chain or both, followed by oxidation to the carboxylic acids; 2) oxidation of the acetylene moiety followed by hydrolysis to the aryl carboxylic acid; and 3) aromatic hydroxylation of the phenyl-acetylene moiety. The primary metabolites OSI-420 and OSI-413 of erlotinib produced by O-demethylation of either side chain have comparable potency to erlotinib in non-clinical *in vitro* assays and *in vivo* tumour models. They are present in plasma at levels that are <10% of erlotinib and display similar pharmacokinetics as erlotinib.

Elimination

Erlotinib is excreted predominantly as metabolites via the faeces (>90%) with renal elimination accounting for only a small amount (approximately 9%) of an oral dose. Less than 2% of the orally administered dose is excreted as parent substance. A population pharmacokinetic analysis in 591 patients receiving single agent erlotinib shows a mean apparent clearance of 4.47 l/hour with a median half-life of 36.2 hours. Therefore, the time to reach steady state plasma concentration would be expected to occur in approximately 7-8 days.

Pharmacokinetics in special populations

Smokers

Based on population pharmacokinetic analysis, no clinically significant relationship between predicted apparent clearance and patient age, bodyweight, gender and ethnicity were observed. Patient factors, which correlated with erlotinib pharmacokinetics, were serum total bilirubin, AAG and current smoking. Increased serum concentrations of total bilirubin and AAG concentrations were associated with a reduced erlotinib clearance. The clinical relevance of these differences is unclear. However, smokers had an increased rate of erlotinib clearance. This was confirmed in a pharmacokinetic study in non-smoking and currently cigarette smoking healthy subjects receiving a single oral dose of 150 mg erlotinib. The geometric mean of the C_{max} was 1056 ng/mL in the non-smokers and 689 ng/mL in the smokers with a mean ratio for smokers to non-smokers of 65.2% (95% CI: 44.3 to 95.9, p=0.031). The geometric mean of the $AUC_{0\text{-}inf}$ was 18726 ng•h/mL in the non-smokers and 6718 ng•h/mL in the smokers with a mean ratio of 35.9% (95% CI: 23.7 to 54.3, p<0.0001). The geometric mean of the C_{24h} was 288 ng/mL in the non-smokers and 34.8 ng/mL in the smokers with a mean ratio of 12.1% (95% CI: 4.82 to 30.2, p=0.0001).
In the pivotal Phase III NSCLC trial, current smokers achieved erlotinib steady state trough plasma concentration of 0.65 µg/mL (n=16) which was approximately 2-fold less than the former smokers or patients who had never smoked (1.28 µg/mL, n=108). This effect was accompanied by a 24% increase in apparent erlotinib plasma clearance. In a phase I dose escalation study in NSCLC patients who were current smokers, pharmacokinetic analyses at steady-state indicated a dose proportional increase in erlotinib exposure when the erlotinib dose was increased from 150 mg to the maximum tolerated dose of 300 mg. Steady-state trough plasma concentrations at a 300 mg dose in current smokers in this study was 1.22 µg/mL (n=17).

Based on the results of pharmacokinetic studies, current smokers should be advised to stop smoking while taking erlotinib, as plasma concentrations could be reduced otherwise.

Based on population pharmacokinetic analysis, the presence of an opioid appeared to increase exposure by about 11%.

A second population pharmacokinetic analysis was conducted that incorporated erlotinib data from 204 pancreatic cancer patients who received erlotinib plus gemcitabine. This analysis demonstrated that covariants affecting erlotinib clearance in patients from the pancreatic study were very similar to those seen in the prior single agent pharmacokinetic analysis. No new covariate effects were identified. Co-administration of gemcitabine had no effect on erlotinib plasma clearance.

Paediatric population

There have been no specific studies in paediatric patients.

Elderly
There have been no specific studies in elderly patients.

Hepatic impairment
Erlotinib is primarily cleared by the liver. In patients with solid tumours and with moderately impaired hepatic function (Child-Pugh score 7-9), geometric mean erlotinib AUC_{0-t} and C_{max} was were similar to that in patients with adequate hepatic function including patients with primary liver cancer or hepatic metastases. In population pharmacokinetic analysis, increased serum concentrations of total bilirubin were associated with a slower rate of erlotinib clearance.

Renal impairment: Erlotinib and its metabolites are not significantly excreted by the kidney, as less than 9% of a single dose is excreted in the urine. In population pharmacokinetic analysis, no clinically significant relationship was observed between erlotinib clearance and creatinine clearance, but there are no data available for patients with creatinine clearance <15 ml/min.

5.3 Preclinical safety data

Chronic dosing effects observed in at least one animal species or study included effects on the cornea (atrophy, ulceration), skin (follicular degeneration and inflammation, redness, and alopecia), ovary (atrophy), liver (liver necrosis), kidney (renal papillary necrosis and tubular dilatation), and gastrointestinal tract (delayed gastric emptying and diarrhoea). Red blood cell parameters were decreased and white blood cells, primarily neutrophils, were increased. There were treatment-related increases in ALT, AST and bilirubin. These findings were observed at exposures well below clinically relevant exposures.

Based on the mode of action, erlotinib has the potential to be a teratogen. Data from reproductive toxicology tests in rats and rabbits at doses near the maximum tolerated dose and/or maternally toxic doses showed reproductive (embryotoxicity in rats, embryo resorption and foetotoxicity in rabbits) and developmental (decrease in pup growth and survival in rats) toxicity, but was not teratogenic and did not impair fertility. These findings were observed at clinically relevant exposures.

Erlotinib tested negative in conventional genotoxicity studies. Two-year carcinogenicity studies with erlotinib conducted in rats and mice were negative up to exposures exceeding human therapeutic exposure (up to 2-fold and 10-fold higher, respectively, based on C_{max} and/or AUC).

A mild phototoxic skin reaction was observed in rats after UV irradiation.

6. PHARMACEUTICAL PARTICULARS

6.1 List of excipients

Tablet core:
Lactose Monohydrate
Cellulose, Microcrystalline (E460)
Sodium Starch Glycolate Type A
Magnesium Stearate (E470b)

Tablet coat:
Poly (vinyl alcohol) (E1203)
Titanium Dioxide (E171)
Macrogol 3350 (E1521)
Talc (E553b)
Methacrylic Acid – Ethyl Acrylate Copolymer (1:1), Type A Sodium Hydrogen Carbonate

6.2 Incompatibilities

Not applicable.

6.3 Shelf life

Please refer to packaging.

6.4 Special precautions for storage

Please refer to packaging.

6.5 Nature and contents of container

Aluminium-OPA/Alu/PVC blisters of 30 tablets, packed into carton boxes.

6.6 Special precautions for disposal

No special requirements for disposal.
Any unused medicinal product or waste material should be disposed of in accordance with local requirements.

7. PRODUCT OWNER

LOTUS INTERNATIONAL PTE. LTD.
80 Robinson Road
#02-00
Singapore 068898

8. DATE OF REVISION OF THE TEXT

03/2022