CAP/IASLC/AMP

Molecular Testing Guideline for Selection of Lung Cancer Patients for EGFR and ALK Tyrosine Kinase Inhibitors

Guideline endorsed by the American Society of Clinical Oncology (ASCO)®
This booklet does not reflect all the recommendations contained within the full guideline. The selected excerpts should not be used in place of the full guideline for clinical decision making.

Abbreviations: ALK, anaplastic lymphoma kinase; AMP, Association for Molecular Pathology; ASCO, American Society of Clinical Oncology; CAP, College of American Pathologists; EGFR, epidermal growth factor receptor; IASLC, International Association for the Study of Lung Cancer.

XALKORI® (crizotinib) is indicated for the treatment of patients with metastatic non-small cell lung cancer (NSCLC) whose tumors are anaplastic lymphoma kinase (ALK) or ROS1-positive as detected by an FDA-approved test.

Please see Important Safety Information on pages 8-10 and full Prescribing Information at the end of this document.

For more information, please visit www.XALKORIhcp.com.
WHEN

Abbreviations: ALK, anaplastic lymphoma kinase; EGFR, epidermal growth factor receptor; TNM, tumor node metastasis.

XALKORI® (crizotinib) is indicated for the treatment of patients with metastatic non-small cell lung cancer (NSCLC) whose tumors are anaplastic lymphoma kinase (ALK) or ROS1-positive as detected by an FDA-approved test.

When should patients be tested?

Disease stage at diagnosis should be taken into account.

ALK rearrangement testing should be ordered at the time of diagnosis for patients presenting with advanced-stage disease (stage IV according to the 7th edition TNM staging system) who are suitable for therapy or at time of recurrence or progression in patients who originally presented with lower-stage disease but were not previously tested.

For these patients, timely diagnosis is critical and molecular testing should be initiated as soon as a diagnosis of adenocarcinoma is established.

Reflex testing, a testing policy that does not require a separate clinician order for each case, is appropriate if agreed on by the lung cancer care team and may help to ensure expedited and consistent routing of specimens for molecular testing.

ALK testing of tumors at diagnosis from patients presenting with stage I, II, or III disease is encouraged, but the decision to do so should be made locally by each laboratory, in collaboration with its oncology team.

Histology may determine which patients should be tested

In the setting of lung cancer resection specimens, EGFR and ALK testing

- Is recommended for adenocarcinomas and mixed lung cancers with an adenocarcinoma component, regardless of histologic grade.
- Is not recommended for fully excised lung cancer specimens that lack any adenocarcinoma component, such as pure squamous cell carcinomas, pure small cell carcinomas, or large cell carcinomas with any immunohistochemistry (IHC) evidence of adenocarcinoma differentiation.

In the setting of more limited lung cancer specimens (biopsies, cytology) where an adenocarcinoma component cannot be completely excluded, EGFR and ALK testing may be performed in cases showing squamous or small cell histology, but clinical criteria (eg, young age, lack of smoking history) may be useful in selecting a subset of these samples for testing.

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**Guideline Highlights**

**What samples should be provided for ALK testing?**

Sufficient tissue of adequate quality is necessary for testing.

To determine EGFR and ALK status for initial treatment selection, primary tumors or metastatic lesions are equally suitable for testing (1.4: Recommendation).

Tissue should be prioritized for EGFR and ALK testing (2.3: Recommendation).

It is critical to retain sufficient material for molecular analysis and to be judicious in the use of sections for IHC studies, histochemical stains, or deeper levels that may not be essential to establish a histopathologic diagnosis (2.3: Recommendation).

A pathologist should be involved in the selection of sections for ALK FISH testing by assessing tumor architecture, cytology, and specimen quality (9.3: Expert consensus opinion).

Specimen requirements for ALK FISH are generally similar to those for EGFR mutation testing; formalin fixation is acceptable, specimens should have enough cancer cells to analyze clearly, and DNA-damaging fixatives or acidic decalcifying agents should be avoided, as should specimens with abundant necrosis. Unlike EGFR mutation testing, however, FISH testing can be problematic when performed on alcohol-fixed samples (9.3: Expert consensus opinion).

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**How long should the testing process take?**

Results should be available within 2 weeks²

EGFR and ALK results should be available within 2 weeks (10 working days) of receiving the specimen in the testing laboratory (3.3: Expert consensus opinion).

A TAT goal of 1 week (5 working days) should be established for EGFR and ALK testing, up to a maximum TAT of 2 weeks (10 working days). This TAT refers to the period from the receipt of suitable material by the molecular pathology laboratory where the testing is performed to the reporting of the final results to the clinical care team, and is not related to the period of time between when a patient undergoes a diagnostic procedure and when a specimen is submitted to the laboratory for testing (3.1: Expert consensus opinion).

Laboratories with average TATs beyond 2 weeks need to make available a more rapid test—either in-house or through a reference laboratory—in instances of clinical urgency (3.2: Recommendation).

Laboratory departments should establish processes to ensure that specimens that have a final histopathologic diagnosis are sent to outside molecular pathology laboratories within 3 working days of receiving requests and to intramural molecular pathology laboratories within 24 hours (3.3: Expert consensus opinion).

Abbreviations: FISH, fluorescence in situ hybridization; TAT, turnaround time.

XALKORI® (crizotinib) is indicated for the treatment of patients with metastatic non-small cell lung cancer (NSCLC) whose tumors are anaplastic lymphoma kinase (ALK) or ROS1-positive as detected by an FDA-approved test.
Biomarker testing is important to determine who may benefit from a biomarker-driven therapy

➤ ALK rearrangement, a therapeutic target in NSCLC, can contribute to cell proliferation and tumor survival1-6
   — EGFR and ALK are associated with approved therapies1-6
➤ As an ALK inhibitor, XALKORI has been shown to block important growth and survival pathways in tumors, which may lead to regression or stabilization of tumors1

XALKORI® (crizotinib) is indicated for the treatment of patients with metastatic non-small cell lung cancer (NSCLC) whose tumors are anaplastic lymphoma kinase (ALK) or ROS1-positive as detected by an FDA-approved test.

SELECTED SAFETY INFORMATION

Hepatotoxicity: Drug-induced hepatotoxicity with fatal outcome occurred in 0.1% of patients treated with XALKORI across clinical trials (n=1719). Transaminase elevations generally occurred within the first 2 months. Monitor liver function tests, including ALT, AST, and total bilirubin, every 2 weeks during the first 2 months of treatment, then once a month, and as clinically indicated, with more frequent repeat testing for increased liver transaminases, alkaline phosphatase, or total bilirubin in patients who develop transaminase elevations. Permanently discontinue for ALT/AST elevation >3 times ULN with concurrent total bilirubin elevation >1.5 times ULN (in the absence of cholestasis or hemolysis); otherwise, temporarily suspend and dose-reduce XALKORI as indicated.

There is no “one type” of patient who has ALK-positive NSCLC

➤ In XALKORI studies, the ALK fusion gene was identified across ages, genders, and ethnicities
   — It was identified predominantly in patients with adenocarcinoma but was found in other histologic types
   — It was identified more frequently in never-smokers but was also seen in former and current smokers

XALKORI provides a reason to test—right from the start

APPROXIMATELY

3%-5%

OF PATIENTS WITH NSCLC HAVE AN ALK-POSITIVE TUMOR1,8

➤ Select patients for the treatment of metastatic NSCLC with XALKORI based on the presence of ALK positivity in tumor specimens as detected by an FDA-approved test8

*Information on FDA-approved tests for the detection of ALK rearrangements in NSCLC is available at http://www.fda.gov/MedicalDevices/ProductsandMedicalProcedures/ InVitroDiagnostics/ucm301431.htm.

Please see Important Safety Information on pages 8-10 and full Prescribing Information at the end of this document.

For more information, please visit www.XALKORIHcp.com.
IMPORTANT SAFETY INFORMATION (CONT'D)

Hepatotoxicity: Drug-induced hepatotoxicity with fatal outcome occurred in 0.1% of patients treated with XALKORI across clinical trials (n=1719). Transaminase elevations generally occurred within the first 2 months. Monitor liver function tests, including ALT, AST, and total bilirubin, every 2 weeks during the first 2 months of treatment, then once a month, and as clinically indicated, with more frequent repeat testing for increased liver transaminases, alkaline phosphatase, and total bilirubin in patients who develop transient elevations. Permanent discontinuation was required in 0.2% of patients (ALTAST elevation >3 times ULN with concurrent total bilirubin elevation >1.5 times ULN (in the absence of other potential causes) and dose-reduction in 1.6% of patients. If discontinuation is required or necessary, restart XALKORI at 250 mg once daily with frequent monitoring.

Bradycardia: Symptomatic bradycardia can occur. Across clinical trials (n=1719), 2.9% of XALKORI-treated patients had any grade ILD, 1.0% had Grade 3/4, and 0.5% had fatal ILD. ILD generally occurred within 3 months after initiation of treatment. Monitor for pulmonary symptoms indicative of ILD/pneumonitis. Exclude other potential causes and permanently discontinue XALKORI in patients with drug-related ILD/pneumonitis.

QT Interval Prolongation: QTc prolongation can occur. Across clinical trials (n=1616), 2.1% of patients had QTcF ≥480 ms, then resume at a reduced dose. Symptomatic bradycardia can occur. Across clinical trials (n=1719), 12.7% of patients treated with XALKORI had bradycardia ≥ 60 bpm. If concomitant medications can be adjusted or discontinued, restart XALKORI at 250 mg once daily with frequent monitoring.

Most commonly visual impairment, photopsia, blurred vision or vitreous floaters, occurred in 63.1% of patients. The majority (95%) of these patients had Grade 1 visual field defect with vision loss; a decision to resume should consider the potential benefits to the patient.

Interstitial Lung Disease (Pneumonitis): Severe, life-threatening, or fatal interstitial lung disease (ILD)/pneumonitis occurred in 2.9% of patients across clinical trials (n=1719). 1.0% of patients had Grade 3/4 and 0.5% had fatal ILD. ILD generally occurred within 3 months after initiation of treatment. Monitor for pulmonary symptoms indicative of ILD/pneumonitis. Exclude other potential causes and permanently discontinue XALKORI in patients with drug-related ILD/pneumonitis.

Severe Visual Loss: Across clinical trials, the incidence of Grade 4 visual field defect with vision loss was 0.2% (n=1719). Discontinue XALKORI in patients with new onset of severe visual loss (best corrected vision less than 20/200 in one or both eyes). Perform an ophthalmological evaluation. There is insufficient information to characterize the risks of resumption of XALKORI in patients with a severe visual loss; a decision to resume should consider the potential benefits to the patient.

Embryo-Fetal Toxicity: XALKORI can cause fetal harm when administered to a pregnant woman. Advise of the potential risk to the fetus. Advise females of reproductive potential and males with female partners of reproductive potential to use effective contraceptive during treatment and for at least 45 days (females) or 90 days (males) respectively, following the final dose of XALKORI.

ROS1-Positive Metastatic NSCLC: Safety was evaluated in 50 patients with ROS1-positive metastatic NSCLC from a single-arm study, and was generally consistent with the safety profile of XALKORI evaluated in patients with ALK-positive metastatic NSCLC. Toxicities occurred in 92% of patients in the ROSI study; 90% of patients had Grade 1 visual disorders and 2% had Grade 2.

Adverse Reactions: Safety was evaluated in a phase 3 study in previously untreated patients with ALK-positive metastatic NSCLC randomized to XALKORI (n=171) or chemotherapy (n=169). Serious adverse events were reported in 34% of patients treated with XALKORI, the most frequent were dyspnea (41%) and pulmonary embolism (2.9%). Fatal adverse events in XALKORI-treated patients occurred with 2.3% of patients, consisting of 1 death due to sepsis, 1 death due to myocardial infarction, 1 death due to pneumonia, and 1 death due to ketoacidosis. Common adverse reactions (all grades) occurring in ≥25% and more commonly (>5%) in patients treated with XALKORI vs chemotherapy were vision disorder (71% vs 10%), diarrhea (61% vs 13%), edema (49% vs 12%), vomiting (46% vs 36%), constipation (43% vs 30%), upper respiratory infection (32% vs 12%), dysgeusia (26% vs 5%), and abdominal pain (26% vs 12%). Grade 3/4 reactions occurring at a ≥2% higher incidence with XALKORI vs chemotherapy were QT prolongation (2% vs 0%), esophagitis (2% vs 0%), and constipation (2% vs 0%). In patients treated with XALKORI vs chemotherapy, the following occurred: elevation of ALT (any grade (79% vs 23%) or Grade 3/4 (15% vs 2%);
IMPORTANT SAFETY INFORMATION (CONT’D)

elevation of AST (any grade [66% vs 28%]) or Grade 3/4 (8% vs 1%); neutropenia (any grade [52% vs 59%] or Grade 3/4 [11% vs 16%]; lymphopenia (any grade [48% vs 53%] or Grade 3/4 [7% vs 13%]; hypophosphatemia (any grade [32% vs 2%] or Grade 3/4 [10% vs 6%]). In patients treated with XALKORI vs chemotherapy, renal cysts occurred (5% vs 1%). Nausea (54%), decreased appetite (30%), fatigue (29%), and neuropathy (21%) also occurred in patients taking XALKORI.

Drug Interactions: Exercise caution with concomitant use of moderate CYP3A inhibitors. Avoid grapefruit or grapefruit juice which may increase plasma concentrations of crizotinib. Concomitant use of strong CYP3A inducers and inhibitors. Avoid concomitant use of CYP3A substrates with narrow therapeutic range in patients taking XALKORI. If concomitant use of CYP3A substrates with narrow therapeutic range is required in patients taking XALKORI, dose reductions of the CYP3A substrates may be required due to adverse reactions.

Lactation: Because of the potential for adverse reactions in breastfed infants, advise females not to breastfeed during treatment with XALKORI and for 45 days after the final dose.

Hepatic Impairment: XALKORI has not been studied in patients with hepatic impairment. As crizotinib is extensively metabolized in the liver, hepatic impairment is likely to increase plasma crizotinib concentrations. Use caution in patients with hepatic impairment.

Renal Impairment: Decreases in estimated glomerular filtration rate occurred in treated patients with XALKORI. Administer XALKORI at a starting dose of 250 mg taken orally once daily in patients with severe renal impairment (CLcr <30 mL/min) not requiring dialysis. No starting dose adjustment is needed for patients with mild and moderate renal impairment.

Please see additional Important Safety Information on pages 8 and 9 and full Prescribing Information at the end of this document.

For more information, please visit www.XALKORIhcp.com.

The discovery and clinical relevance of EGFR and ALK have impacted how NSCLC is diagnosed and treated

Evidence-based guideline recommendations for the molecular testing of lung cancers are available from CAP/IASLC/AMP

These guideline recommendations may aid in the implementation and standardization of biomarker testing in your institution.

• Clinical characteristics should not determine which patients are tested for EGFR and ALK
• Disease stage at diagnosis should be taken into account to determine when a patient’s sample is tested
• Sufficient tissue of adequate quality is necessary for biomarker testing
• Biomarker test results should be available within 2 weeks

See inside for more detailed recommendations from the CAP/IASLC/AMP Molecular Testing Guideline for Selection of Lung Cancer Patients for EGFR and ALK Tyrosine Kinase Inhibitors.

Please see Important Safety Information on pages 8-10 and full Prescribing Information at the end of this document.

References:
16. Clinical characteristics should not determine which patients are tested for biomarkers.
Summary of Recommendations

SECTION I. WHEN SHOULD MOLECULAR TESTING OF LUNG CANCERS BE PERFORMED?

QUESTION 1. WHICH PATIENTS SHOULD BE TESTED FOR EGFR MUTATIONS AND ALK REARRANGEMENTS?

1.1a: Recommendation: EGFR molecular testing should be used to select patients for EGFR-targeted TKI therapy, and patients with lung adenocarcinoma should not be excluded from testing on the basis of clinical characteristics.

1.1b: Recommendation: ALK molecular testing should be used to select patients for ALK-targeted TKI, and patients with lung adenocarcinoma should not be excluded from testing on the basis of clinical characteristics.

1.2: Recommendation: In the setting of lung cancer resection specimens, EGFR and ALK testing is recommended for adenocarcinomas and mixed lung cancers with an adenocarcinoma component, regardless of histologic grade. In the setting of fully excised lung cancer specimens, EGFR and ALK testing is not recommended in lung cancers that lack any adenocarcinoma component, such as “pure” squamous cell carcinomas, “pure” small cell carcinomas, or large cell carcinomas lacking any immunohistochemistry (IHC) evidence of adenocarcinoma differentiation.

1.3: Recommendation: In the setting of more limited lung cancer specimens (biopsies, cytology) where an adenocarcinoma component cannot be completely excluded, EGFR and ALK testing may be performed in cases showing squamous or small cell histology, but clinical criteria (eg, young age, lack of smoking history) may be useful in selecting a subset of these samples for testing.

1.4: Recommendation: To determine EGFR and ALK status for initial treatment selection, primary tumors or metastatic lesions are equally suitable for testing.

1.5: Expert consensus opinion: For patients with multiple, apparently separate, primary lung adenocarcinomas, each tumor may be tested, but testing of multiple different areas within a single tumor is not necessary.

QUESTION 2. WHEN SHOULD A PATIENT SPECIMEN BE TESTED FOR EGFR MUTATION OR ALK REARRANGEMENT?

2.1a: Recommendation: EGFR mutation testing should be ordered at the time of diagnosis for patients presenting with advanced-stage disease (stage IV according to the 7th edition TNM staging system) who are suitable for therapy or at time of recurrence or progression in patients who originally presented with lower-stage disease but were not previously tested.

2.1b: Suggestion: ALK rearrangement testing should be ordered at the time of diagnosis for patients presenting with advanced-stage disease (stage IV according to the 7th edition TNM staging system) who are suitable for therapy or at time of recurrence or progression in patients who originally presented with lower-stage disease but were not previously tested.

2.2a: Expert consensus opinion: EGFR testing of tumors at diagnosis from patients presenting with stage I, II, or III disease is encouraged, but the decision to do so should be made locally by each laboratory, in collaboration with its oncology team.
2.2b: Expert consensus opinion: ALK testing of tumors at diagnosis from patients presenting with stage I, II, or III disease is encouraged, but the decision to do so should be made locally by each laboratory, in collaboration with its oncology team.

2.3: Recommendation: Tissue should be prioritized for EGFR and ALK testing.

QUESTION 3. HOW RAPIDLY SHOULD TEST RESULTS BE AVAILABLE?

3.1: Expert consensus opinion: EGFR and ALK results should be available within 2 weeks (10 working days) of receiving the specimen in the testing laboratory.

3.2: Expert consensus opinion: Laboratories with average turnaround times beyond 2 weeks need to make available a more rapid test—either in-house or through a reference laboratory—in instances of clinical urgency.

3.3: Expert consensus opinion: Laboratory departments should establish processes to ensure that specimens that have a final histopathologic diagnosis are sent to outside molecular pathology laboratories within 3 working days of receiving requests and to intramural molecular pathology laboratories within 24 hours.

SECTION II. HOW SHOULD EGFR TESTING BE PERFORMED?

QUESTION 4. HOW SHOULD SPECIMENS BE PROCESSED FOR EGFR MUTATION TESTING?

4.1: Expert consensus opinion: Pathologists should use formalin-fixed, paraffin-embedded (FFPE) specimens or fresh, frozen, or alcohol-fixed specimens for PCR-based EGFR mutation tests. Other tissue treatments (eg, acidic or heavy metal fixatives, or decalcifying solutions) should be avoided in specimens destined for EGFR testing.

4.2: Expert consensus opinion: Cytologic samples are also suitable for EGFR and ALK testing, with cell blocks being preferred over smear preparations.

QUESTION 5. WHAT ARE THE SPECIMEN REQUIREMENTS FOR EGFR TESTING?

5.1: Expert consensus opinion: Pathologists should determine the adequacy of specimens for EGFR testing by assessing cancer cell content and DNA quantity and quality.

5.2: Expert consensus opinion: Each laboratory should establish the minimum proportion and number of cancer cells needed for mutation detection during validation.

5.3: Expert consensus opinion: A pathologist should assess the tumor content of each specimen and either perform, or guide a trained technologist to perform, microdissection for tumor cell enrichment as needed.

QUESTION 6. HOW SHOULD EGFR TESTING BE PERFORMED?

6.1: Recommendation: Laboratories may use any validated EGFR testing method with sufficient performance characteristics.

6.2: Expert consensus opinion: Laboratories should use EGFR test methods that are able to detect mutations in specimens with at least 50% cancer cell content, although laboratories are strongly encouraged to use (or have available at an external reference laboratory) more sensitive tests that are able to detect mutations in specimens with as little as 10% cancer cells.
6.3: Expert consensus opinion: Clinical EGFR mutation testing should be able to detect all individual mutations that have been reported with a frequency of at least 1% of EGFR-mutated lung adenocarcinomas.

6.4: Recommendation: Immunohistochemistry for total EGFR is not recommended for selection of EGFR TKI therapy.

6.5: Recommendation: EGFR copy number analysis (ie, FISH or CISH) is not recommended for selection of EGFR TKI therapy.

**QUESTION 7. WHAT IS THE ROLE OF KRAS ANALYSIS IN SELECTING PATIENTS FOR TARGETED THERAPY WITH EGFR TKIs?**

7.1: Recommendation: KRAS mutation testing is not recommended as a sole determinant of EGFR TKI therapy.

**QUESTION 8. WHAT ADDITIONAL TESTING CONSIDERATIONS ARE IMPORTANT IN THE SETTING OF SECONDARY OR ACQUIRED EGFR TKI RESISTANCE?**

8.1: Recommendation: If a laboratory performs testing on specimens from patients with acquired resistance to EGFR kinase inhibitors, such tests should be able to detect the secondary EGFR T790M mutation in as few as 5% of cells.

**SECTION III. HOW SHOULD ALK TESTING BE PERFORMED?**

**QUESTION 9. WHAT METHODS SHOULD BE USED FOR ALK TESTING?**

9.1: Recommendation: Laboratories should use an ALK FISH assay using dual-labeled break-apart probes for selecting patients for ALK TKI therapy; ALK immunohistochemistry, if carefully validated, may be considered as a screening methodology to select specimens for ALK FISH testing.

9.2: Recommendation: RT-PCR is not recommended as an alternative to FISH for selecting patients for ALK inhibitor therapy.

9.3: Expert consensus opinion: A pathologist should be involved in the selection of sections for ALK FISH testing by assessing tumor architecture, cytology, and specimen quality.

9.4: Expert consensus opinion: A pathologist should participate in the interpretation of ALK FISH slides, either by performing the analysis directly or by reviewing the interpretations of cytogeneticists or technologists with specialized training in solid tumor FISH analysis.

9.5: Expert consensus opinion: Testing for secondary mutations in ALK associated with acquired resistance to ALK inhibitors is not currently required for clinical management.

**SECTION IV: SHOULD OTHER GENES BE ROUTINELY TESTED IN LUNG ADENOCARCINOMA?**

**QUESTION 10. ARE OTHER MOLECULAR MARKERS SUITABLE FOR TESTING IN LUNG CANCER?**

10.1a: Recommendation: Testing for EGFR should be prioritized over other molecular markers in lung adenocarcinoma.

10.1b: Suggestion: After EGFR testing, testing for ALK should be prioritized over other proposed molecular markers in lung adenocarcinoma, for which published evidence is insufficient to support testing guideline development at the present time.
SECTION V: HOW SHOULD MOLECULAR TESTING OF LUNG ADENOCARCINOMAS BE IMPLEMENTED AND OPERATIONALIZED?

QUESTION 11. MUST ALL ADENOCARCINOMAS BE TESTED FOR BOTH EGFR AND ALK?

11.1: Expert consensus opinion: Laboratories may implement testing algorithms to enhance the efficiency of molecular testing of lung adenocarcinomas, provided the overall turnaround time requirements are met.

QUESTION 12. HOW SHOULD EGFR AND ALK RESULTS BE REPORTED?

12.1: Expert consensus opinion: EGFR mutation testing reports and ALK FISH reports should include a results and interpretation section readily understandable by oncologists and by nonspecialist pathologists.

QUESTION 13. HOW SHOULD EGFR AND ALK TESTING BE VALIDATED?

13.1: Expert consensus opinion: EGFR and ALK testing validation should follow the same guidelines as for other molecular diagnostics and FISH tests.

QUESTION 14. HOW SHOULD QUALITY ASSURANCE BE MAINTAINED?

14.1: Expert consensus opinion: Laboratories should follow similar quality control and quality assurance policies and procedures for EGFR and ALK testing in lung cancers as for other clinical laboratory assays. In particular, laboratories performing EGFR and ALK testing for TKI therapy should enroll in proficiency testing, if available.

Abbreviations: ALK, anaplastic lymphoma kinase; AMP, Association for Molecular Pathology; CAP, College of American Pathologists; CISH, chromogenic in situ hybridization; EGFR, epidermal growth factor receptor; FISH, fluorescence in situ hybridization; IASLC, International Association for the Study of Lung Cancer; KRAS, Kirsten rat sarcoma; PCR, polymerase chain reaction; RT-PCR, reverse transcription-polymerase chain reaction; TKI, tyrosine kinase inhibitor; TNM, tumor node metastasis.

XALKORI® (crizotinib) capsules, for oral use

Initial U.S. Approval: 2011

HIGHLIGHTS OF PRESCRIBING INFORMATION

These highlights do not include all the information needed to use XALKORI® safely and effectively. See full prescribing information for XALKORI.

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XALKORI® is a kinase inhibitor indicated for the treatment of patients with metastatic non-small cell lung cancer (NSCLC) whose tumors are anaplastic lymphoma kinase (ALK) or ROS1-positive as detected by an FDA-approved test.

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**Dosage and Administration**

- **Recommended Dose:** 250 mg orally, twice daily. (2.2)
- **Renal Impairment:** 250 mg orally, once daily in patients with severe renal impairment (creatinine clearance <30 mL/min) not requiring dialysis. (2.2)

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**DOSAGE FORMS AND STRENGTHS**

Capsules: 250 mg and 200 mg. (3)

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**Contraindications**

None. (4)

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**Warnings and Precautions**

- **Hepatotoxicity:** Fatal hepatotoxicity occurred in 0.1% of patients. Monitor with periodic liver testing. Temporarily suspend, dose reduce, or permanently discontinue XALKORI. (5.1)
- **Interstitial Lung Disease (ILD)/Pneumonitis:** Occurred in 2.9% of patients. Permanently discontinue in patients with ILD/pneumonitis. (5.2)

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**Adverse Reactions**

The most common adverse reactions (≥25%) are vision disorders, nausea, diarrhea, vomiting, edema, constipation, elevated transaminases, fatigue, decreased appetite, upper respiratory infection, dizziness, and neuropathy. (6)

To report SUSPECTED ADVERSE REACTIONS, contact Pfizer Inc. at 1-800-438-1985 or FDA at 1-800-FDA-1088 or www.fda.gov/medwatch.

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**Drug Interactions**

- **CYP3A Inhibitors:** Avoid concurrent use of XALKORI with strong CYP3A inhibitors. (7.1)
- **CYP3A Inducers:** Avoid concurrent use of XALKORI with strong CYP3A inducers. (7.2)
- **CYP3A Substrates:** Avoid concurrent use of XALKORI with CYP3A substrates with narrow therapeutic indices. (7.3)

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**Use in Specific Populations**

Lactation: Do not breastfeed while taking XALKORI. (8.2)

See 17 for PATIENT COUNSELING INFORMATION and FDA-approved patient labeling.

Revised: 7/2017
FULL PRESCRIBING INFORMATION

1 INDICATIONS AND USAGE

XALKORI is indicated for the treatment of patients with metastatic non-small cell lung cancer (NSCLC) whose tumors are anaplastic lymphoma kinase (ALK) or ROS1-positive as detected by an FDA-approved test [see Clinical Studies (14.1 and 14.2)].

2 DOSAGE AND ADMINISTRATION

2.1 Patient Selection

Select patients for the treatment of metastatic NSCLC with XALKORI based on the presence of ALK or ROS1 positivity in tumor specimens [see Indications and Usage (1) and Clinical Studies (14.1, 14.2)].

Information on FDA-approved tests for the detection of ALK and ROS1 rearrangements in NSCLC is available at http://www.fda.gov/MedicalDevices/ProductsandMedicalProcedures/InVitroDiagnostics/ucm301431.htm.

2.2 Recommended Dosing

The recommended dose of XALKORI is 250 mg orally, twice daily until disease progression or no longer tolerated by the patient.

The recommended dose of XALKORI in patients with severe renal impairment [creatinine clearance (CL\text{cr}) <30 mL/min] not requiring dialysis is 250 mg orally, once daily [see Use in Specific Populations (8.7) and Clinical Pharmacology (12.3)].

XALKORI may be taken with or without food. Swallow capsules whole. If a dose of XALKORI is missed, make up that dose unless the next dose is due within 6 hours. If vomiting occurs after taking a dose of XALKORI, take the next dose at the regular time.

2.3 Dose Modification

Reduce dose as below, if 1 or more dose reductions are necessary due to adverse reactions of Grade 3 or 4 severity, as defined by National Cancer Institute Common Terminology Criteria for Adverse Events (NCI CTCAE) version 4.0:

- First dose reduction: XALKORI 200 mg taken orally twice daily
- Second dose reduction: XALKORI 250 mg taken orally once daily
- Permanently discontinue if unable to tolerate XALKORI 250 mg taken orally once daily

Dose reduction guidelines are provided in Tables 1 and 2.

<table>
<thead>
<tr>
<th>Grade</th>
<th>XALKORI Dosing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade 3</td>
<td>Withhold until recovery to Grade 2 or less, then resume at the same dose schedule</td>
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<tr>
<td>Grade 4</td>
<td>Withhold until recovery to Grade 2 or less, then resume at next lower dose</td>
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*Except lymphopenia (unless associated with clinical events, e.g., opportunistic infections).
### Table 2. XALKORI Dose Modification – Non-Hematologic Toxicities

<table>
<thead>
<tr>
<th>Criteria</th>
<th>XALKORI Dosing</th>
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<tbody>
<tr>
<td>Alanine aminotransferase (ALT) or aspartate aminotransferase (AST) elevation greater than 5 times upper limit of normal (ULN) with total bilirubin less than or equal to 1.5 times ULN</td>
<td>Withhold until recovery to baseline or less than or equal to 3 times ULN, then resume at reduced dose.</td>
</tr>
<tr>
<td>ALT or AST elevation greater than 3 times ULN with concurrent total bilirubin elevation greater than 1.5 times ULN (in the absence of cholestasis or hemolysis)</td>
<td>Permanently discontinue.</td>
</tr>
<tr>
<td>Any grade drug-related interstitial lung disease/pneumonitis</td>
<td>Permanently discontinue.</td>
</tr>
<tr>
<td>QT corrected for heart rate (QTc) greater than 500 ms on at least 2 separate electrocardiograms (ECGs)</td>
<td>Withhold until recovery to baseline or to a QTc less than 481 ms, then resume at reduced dose.</td>
</tr>
<tr>
<td>QTc greater than 500 ms or greater than or equal to 60 ms change from baseline with Torsade de pointes or polymorphic ventricular tachycardia or signs/symptoms of serious arrhythmia</td>
<td>Permanently discontinue.</td>
</tr>
</tbody>
</table>
| Bradycardia\(^a\) (symptomatic, may be severe and medically significant, medical intervention indicated) | Withhold until recovery to asymptomatic bradycardia or to a heart rate of 60 bpm or above.  
Evaluate concomitant medications known to cause bradycardia, as well as antihypertensive medications.  
If contributing concomitant medication is identified and discontinued, or its dose is adjusted, resume at previous dose upon recovery to asymptomatic bradycardia or to a heart rate of 60 bpm or above.  
If no contributing concomitant medication is identified, or if contributing concomitant medications are not discontinued or dose modified, resume at reduced dose upon recovery to asymptomatic bradycardia or to a heart rate of 60 bpm or above. |
| Bradycardia\(^a,b\) (life-threatening consequences, urgent intervention indicated) | Permanently discontinue if no contributing concomitant medication is identified.  
If contributing concomitant medication is identified and discontinued, or its dose is adjusted, resume at 250 mg once daily upon recovery to asymptomatic bradycardia or to a heart rate of 60 bpm or above, with frequent monitoring. |
| Visual Loss (Grade 4 Ocular Disorder)                                   | Discontinue during evaluation of severe vision loss.                          |

\(^a\) Heart rate less than 60 beats per minute (bpm).  
\(^b\) Permanently discontinue for recurrence.

Monitor complete blood counts including differential white blood cell counts monthly and as clinically indicated, with more frequent repeat testing if Grade 3 or 4 abnormalities are observed, or if fever or infection occurs.
3 DOSAGE FORMS AND STRENGTHS

- 250 mg capsules: hard gelatin capsule, size 0, pink opaque cap and body, with “Pfizer” on the cap and “CRZ 250” on the body.

- 200 mg capsules: hard gelatin capsule, size 1, white opaque body and pink opaque cap, with “Pfizer” on the cap and “CRZ 200” on the body.

4 CONTRAINDICATIONS

None.

5 WARNINGS AND PRECAUTIONS

5.1 Hepatotoxicity

Drug-induced hepatotoxicity with fatal outcome occurred in 2 (0.1%) of the 1719 patients treated with XALKORI across clinical trials. Concurrent elevations in alanine aminotransferase (ALT) or aspartate aminotransferase (AST) greater than or equal to 3 times the upper limit of normal (ULN) and total bilirubin greater than or equal to 2 times the ULN, with normal alkaline phosphatase, occurred in 10 patients (<1%) treated with XALKORI. Elevations in ALT or AST greater than 5 times the ULN occurred in 187 (11.2%) and 95 (5.7%) patients, respectively. Seventeen patients (1.0%) required permanent discontinuation due to elevated transaminases. Transaminase elevations generally occurred within the first 2 months of treatment.

Monitor liver function tests, including ALT, AST, and total bilirubin, every 2 weeks during the first 2 months of treatment, then once a month, and as clinically indicated, with more frequent repeat testing for increased liver transaminases, alkaline phosphatase, or total bilirubin in patients who develop transaminase elevations. Temporarily suspend, dose reduce, or permanently discontinue XALKORI as described in Table 2 [see Dosage and Administration (2.3) and Adverse Reactions (6)].

5.2 Interstitial Lung Disease (Pneumonitis)

Severe, life-threatening, or fatal interstitial lung disease (ILD)/pneumonitis can occur in patients treated with XALKORI. Across clinical trials (n=1719), 50 XALKORI-treated patients (2.9%) had ILD of any grade, 18 patients (1.0%) had Grade 3 or 4 ILD, and 8 patients (0.5%) had fatal ILD. Interstitial lung disease generally occurred within 3 months after the initiation of XALKORI.

Monitor patients for pulmonary symptoms indicative of ILD/pneumonitis. Exclude other potential causes of ILD/pneumonitis, and permanently discontinue XALKORI in patients diagnosed with drug-related ILD/pneumonitis [see Dosage and Administration (2.3) and Adverse Reactions (6)].

5.3 QT Interval Prolongation

QTc prolongation can occur in patients treated with XALKORI. Across clinical trials, 34 of 1616 patients (2.1%) had QTcF (corrected QT for heart rate by the Fridericia method) greater than or equal to 500 ms and 79 of 1582 patients (5.0%) had an increase from baseline QTcF greater than or equal to 60 ms by automated machine-read evaluation of ECGs.

Avoid use of XALKORI in patients with congenital long QT syndrome. Monitor ECGs and electrolytes in patients with congestive heart failure, bradyarrhythmias, electrolyte abnormalities, or who are taking
medications that are known to prolong the QT interval. Permanently discontinue XALKORI in patients who develop QTc greater than 500 ms or greater than or equal to 60 ms change from baseline with Torsade de pointes or polymorphic ventricular tachycardia or signs/symptoms of serious arrhythmia. Withhold XALKORI in patients who develop QTc greater than 500 ms on at least 2 separate ECGs until recovery to a QTc less than or equal to 480 ms, then resume XALKORI at a reduced dose as described in Table 2 [see Dosage and Administration (2.3) and Clinical Pharmacology (12.2)].

5.4 Bradycardia

Symptomatic bradycardia can occur in patients receiving XALKORI. Across clinical trials, bradycardia occurred in 219 (12.7%) of 1719 patients treated with XALKORI. Grade 3 syncope occurred in 2.4% of XALKORI-treated patients and in 0.6% of the chemotherapy-treated patients.

Avoid using XALKORI in combination with other agents known to cause bradycardia (e.g., beta-blockers, non-dihydropyridine calcium channel blockers, clonidine, and digoxin) to the extent possible. Monitor heart rate and blood pressure regularly. In cases of symptomatic bradycardia that is not life-threatening, hold XALKORI until recovery to asymptomatic bradycardia or to a heart rate of 60 bpm or above, re-evaluate the use of concomitant medications, and adjust the dose of XALKORI. Permanently discontinue for life-threatening bradycardia due to XALKORI; however, if associated with concomitant medications known to cause bradycardia or hypotension, hold XALKORI until recovery to asymptomatic bradycardia or to a heart rate of 60 bpm or above, and if concomitant medications can be adjusted or discontinued, restart XALKORI at 250 mg once daily with frequent monitoring [see Dosage and Administration (2.3) and Adverse Reactions (6)].

5.5 Severe Visual Loss

Across all clinical trials, the incidence of Grade 4 visual field defect with vision loss was 0.2% (4/1719). Optic atrophy and optic nerve disorder have been reported as potential causes of vision loss.

Discontinue XALKORI in patients with new onset of severe visual loss (best corrected vision less than 20/200 in one or both eyes). Perform an ophthalmological evaluation consisting of best corrected visual acuity, retinal photographs, visual fields, optical coherence tomography (OCT) and other evaluations as appropriate for new onset of severe visual loss. There is insufficient information to characterize the risks of resumption of XALKORI in patients with a severe visual loss; a decision to resume XALKORI should consider the potential benefits to the patient.

5.6 Embryo-Fetal Toxicity

Based on its mechanism of action, XALKORI can cause fetal harm when administered to a pregnant woman. In animal reproduction studies, oral administration of crizotinib in pregnant rats during organogenesis at exposures similar to those observed with the maximum recommended human dose resulted in embryotoxicity and fetotoxicity. Advise pregnant women of the potential risk to a fetus. Advise females of reproductive potential to use effective contraception during treatment with XALKORI and for at least 45 days following the final dose [see Use in Specific Populations (8.1, 8.3)]. Advise male patients with female partners of reproductive potential to use condoms during treatment with XALKORI and for at least 90 days after the final dose [see Use in Specific Populations (8.3) and Nonclinical Toxicology (13.1)].

6 ADVERSE REACTIONS

The following adverse reactions are discussed in greater detail in other sections of the labeling:

- Hepatotoxicity [see Warnings and Precautions (5.1)]
• Interstitial Lung Disease (Pneumonitis) [see Warnings and Precautions (5.2)]
• QT Interval Prolongation [see Warnings and Precautions (5.3)]
• Bradycardia [see Warnings and Precautions (5.4)]
• Severe Visual Loss [see Warnings and Precautions (5.5)]

6.1 Clinical Trials Experience

Because clinical trials are conducted under widely varying conditions, adverse reaction rates observed in the clinical trials of a drug cannot be directly compared to rates in the clinical trials of another drug and may not reflect the rates observed in clinical practice.

The data in the Warnings and Precautions section reflect exposure to XALKORI in 1719 patients who received XALKORI 250 mg twice daily enrolled on Studies 1 (including an additional 109 patients who crossed over from the control arm), 2, 3, a single arm trial (n=1063) of ALK-positive NSCLC, and an additional ALK-positive NSCLC expansion cohort of a dose finding study (n=154) [see Warnings and Precautions (5)].

The data described below is based primarily on 343 patients with ALK-positive metastatic NSCLC who received XALKORI 250 mg twice daily from 2 open-label, randomized, active-controlled trials (Studies 1 and 2). The safety of XALKORI was also evaluated in 50 patients with ROS1-positive metastatic NSCLC from a single-arm study (Study 3).

The most common adverse reactions (≥25%) of XALKORI are vision disorders, nausea, diarrhea, vomiting, edema, constipation, elevated transaminases, fatigue, decreased appetite, upper respiratory infection, dizziness, and neuropathy.

Previously Untreated ALK-Positive Metastatic NSCLC - Study 1

The data in Table 3 are derived from 340 patients with ALK-positive metastatic NSCLC who had not received previous systemic treatment for advanced disease who received treatment in a randomized, multicenter, open-label, active-controlled trial (Study 1). Patients in the XALKORI arm (n=171) received XALKORI 250 mg orally twice daily until documented disease progression, intolerance to therapy, or the investigator determined that the patient was no longer experiencing clinical benefit. A total of 169 patients in the chemotherapy arm received pemetrexed 500 mg/m² in combination with cisplatin 75 mg/m² (n=91) or carboplatin at a dose calculated to produce an area under the concentration-time curve (AUC) of 5 or 6 mg min/mL (n=78). Chemotherapy was given by intravenous infusion every 3 weeks for up to 6 cycles, in the absence of dose-limiting chemotherapy-related toxicities. After 6 cycles, patients remained on study with no additional anticancer treatment, and tumor assessments continued until documented disease progression.

The median duration of study treatment was 10.9 months for patients in the XALKORI arm and 4.1 months for patients in the chemotherapy arm. Median duration of treatment was 5.2 months for patients who received XALKORI after cross over from chemotherapy. Across the 340 patients who were treated in Study 1, the median age was 53 years; 16% of patients were older than 65 years. A total of 62% of patients were female and 46% were Asian.

Serious adverse events were reported in 58 patients (34%) treated with XALKORI. The most frequent serious adverse events reported in patients treated with XALKORI were dyspnea (4.1%) and pulmonary embolism (2.9%). Fatal adverse events in XALKORI-treated patients occurred in 2.3% patients, consisting of septic shock, acute respiratory failure, and diabetic ketoacidosis.
Dose reductions due to adverse reactions were required in 6.4% of XALKORI-treated patients. The most frequent adverse reactions that led to dose reduction in these patients were nausea (1.8%) and elevated transaminases (1.8%).

Permanent discontinuation of XALKORI treatment for adverse reactions was 8.2%. The most frequent adverse reactions that led to permanent discontinuation in XALKORI-treated patients were elevated transaminases (1.2%), hepatotoxicity (1.2%), and ILD (1.2%).

Tables 3 and 4 summarize common adverse reactions and laboratory abnormalities in XALKORI-treated patients.
Table 3. Adverse Reactions Reported at a Higher Incidence (≥5% Higher for All Grades or ≥2% Higher for Grades 3-4) with XALKORI than Chemotherapy in Study 1†

<table>
<thead>
<tr>
<th>Adverse Reaction</th>
<th>XALKORI (N=171)</th>
<th>Chemotherapy (Pemetrexed/Cisplatin or Pemetrexed/Carboplatin) (N=169)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>All Grades (%)</td>
<td>Grade 3-4 (%)</td>
</tr>
<tr>
<td></td>
<td>Grade 3-4 (%)</td>
<td>All Grades (%)</td>
</tr>
<tr>
<td></td>
<td>Grade 3-4 (%)</td>
<td></td>
</tr>
<tr>
<td><strong>Cardiac Disorders</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electrocardiogram QT prolonged</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>Bradycardiaa</td>
<td>14</td>
<td>1</td>
</tr>
<tr>
<td><strong>Eye Disorders</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vision disorderb</td>
<td>71</td>
<td>1</td>
</tr>
<tr>
<td><strong>Gastrointestinal Disorders</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vomiting</td>
<td>46</td>
<td>36</td>
</tr>
<tr>
<td>Diarrhea</td>
<td>61</td>
<td>13</td>
</tr>
<tr>
<td>Constipation</td>
<td>43</td>
<td>30</td>
</tr>
<tr>
<td>Dyspepsia</td>
<td>14</td>
<td>2</td>
</tr>
<tr>
<td>Dysphagia</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>Abdominal painc</td>
<td>26</td>
<td>12</td>
</tr>
<tr>
<td>Esophagitisd</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td><strong>General Disorders and</strong> Administration</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Site Conditions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Edemae</td>
<td>49</td>
<td>12</td>
</tr>
<tr>
<td>Pyrexia</td>
<td>19</td>
<td>11</td>
</tr>
<tr>
<td><strong>Infections and Infestations</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upper respiratory infectionf</td>
<td>32</td>
<td>12</td>
</tr>
<tr>
<td><strong>Investigations</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Increased weight</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td><strong>Musculoskeletal and Connective</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tissue Disorders</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pain in extremity</td>
<td>16</td>
<td>7</td>
</tr>
<tr>
<td>Muscle spasm</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td><strong>Nervous System Disorders</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dizzinessg</td>
<td>18</td>
<td>10</td>
</tr>
<tr>
<td>Dysgeusia</td>
<td>26</td>
<td>5</td>
</tr>
<tr>
<td>Headache</td>
<td>22</td>
<td>15</td>
</tr>
</tbody>
</table>

† Adverse reactions were graded using NCI CTCAE version 4.0.
Includes cases reported within the clustered terms:
a Bradycardia (Bradycardia, Sinus bradycardia).
b Vision Disorder (Diplopia, Photophobia, Photopsia, Reduced visual acuity, Blurred vision, Vitreous floaters, Visual impairment).
c Abdominal pain (Abdominal discomfort, Abdominal pain, Lower abdominal pain, Upper abdominal pain, Abdominal tenderness).
d Esophagitis (Esophagitis, Esophageal ulcer).
e Edema (Edema, Peripheral edema, Face edema, Generalized edema, Local swelling, Periorbital edema).
f Upper respiratory infection (Nasopharyngitis, Pharyngitis, Rhinitis, Upper respiratory tract infection).
g Dizziness (Balance disorder, Dizziness, Postural dizziness, Presyncope).

Additional adverse reactions occurring at an overall incidence between 1% and 60% in patients treated with XALKORI included nausea (56%), decreased appetite (30%), fatigue (29%), neuropathy (21%; gait disturbance, hypoesthesia, muscular weakness, neuralgia, neuropathy peripheral, paresthesia, peripheral sensory neuropathy, polyneuropathy, sensory disturbance), rash (11%), renal cyst (5%), ILD (1%; ILD, pneumonitis), syncope (1%), and decreased blood testosterone (1%; hypogonadism).
Table 4. Laboratory Abnormalities with Grade 3 or 4 Incidence of ≥4% in XALKORI-Treated Patients in Study 1

<table>
<thead>
<tr>
<th>Laboratory Abnormality</th>
<th>XALKORI</th>
<th>Chemotherapy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Any Grade (%)</td>
<td>Grade 3-4 (%)</td>
</tr>
<tr>
<td>Hematology</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neutropenia</td>
<td>52</td>
<td>11</td>
</tr>
<tr>
<td>Lymphopenia</td>
<td>48</td>
<td>7</td>
</tr>
<tr>
<td>Chemistry</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALT elevation</td>
<td>79</td>
<td>15</td>
</tr>
<tr>
<td>AST elevation</td>
<td>66</td>
<td>8</td>
</tr>
<tr>
<td>Hypophosphatemia</td>
<td>32</td>
<td>10</td>
</tr>
</tbody>
</table>

Additional laboratory test abnormality in patients treated with XALKORI was an increase in creatinine (Any Grade: 99%; Grade 3: 2%; Grade 4: 0%) compared to the chemotherapy arm (Any Grade: 92%; Grade 3: 0%; Grade 4: 1%).

Previously Treated ALK-Positive Metastatic NSCLC - Study 2

The data in Table 5 are derived from 343 patients with ALK-positive metastatic NSCLC enrolled in a randomized, multicenter, active-controlled, open-label trial (Study 2). Patients in the XALKORI arm (n=172) received XALKORI 250 mg orally twice daily until documented disease progression, intolerance to therapy, or the investigator determined that the patient was no longer experiencing clinical benefit. A total of 171 patients in the chemotherapy arm received pemetrexed 500 mg/m$^2$ (n=99) or docetaxel 75 mg/m$^2$ (n=72) by intravenous infusion every 3 weeks until documented disease progression, intolerance to therapy, or the investigator determined that the patient was no longer experiencing clinical benefit. Patients in the chemotherapy arm received pemetrexed unless they had received pemetrexed as part of first-line or maintenance treatment.

The median duration of study treatment was 7.1 months for patients who received XALKORI and 2.8 months for patients who received chemotherapy. Across the 347 patients who were randomized to study treatment (343 received at least 1 dose of study treatment), the median age was 50 years; 14% of patients were older than 65 years. A total of 56% of patients were female and 45% of patients were Asian.

Serious adverse reactions were reported in 64 patients (37.2%) treated with XALKORI and 40 patients (23.4%) in the chemotherapy arm. The most frequent serious adverse reactions reported in patients treated with XALKORI were pneumonia (4.1%), pulmonary embolism (3.5%), dyspnea (2.3%), and ILD (2.9%). Fatal adverse reactions in XALKORI-treated patients in Study 2 occurred in 9 (5%) patients, consisting of: acute respiratory distress syndrome, arrhythmia, dyspnea, pneumonia, pneumonitis, pulmonary embolism, ILD, respiratory failure, and sepsis.

Dose reductions due to adverse reactions were required in 16% of XALKORI-treated patients. The most frequent adverse reactions that led to dose reduction in the patients treated with XALKORI were ALT elevation (7.6%) including some patients with concurrent AST elevation, QTc prolongation (2.9%), and neutropenia (2.3%).

XALKORI was discontinued for adverse reactions in 15% of patients. The most frequent adverse reactions that led to discontinuation of XALKORI were ILD (1.7%), ALT and AST elevation (1.2%), dyspnea (1.2%), and pulmonary embolism (1.2%).

Tables 5 and 6 summarize common adverse reactions and laboratory abnormalities in XALKORI-treated patients.
Table 5. Adverse Reactions Reported at a Higher Incidence (≥5% Higher for All Grades or ≥2% Higher for Grades 3/4) with XALKORI than Chemotherapy in Study 2

<table>
<thead>
<tr>
<th>Adverse Reaction</th>
<th>XALKORI (N=172)</th>
<th>Chemotherapy (Pemetrexed or Docetaxel) (N=171)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>All Grades (%)</td>
<td>Grade 3-4 (%)</td>
</tr>
<tr>
<td><strong>Nervous System Disorders</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dizziness&lt;sup&gt;a&lt;/sup&gt;</td>
<td>22</td>
<td>1</td>
</tr>
<tr>
<td>Dysgeusia</td>
<td>26</td>
<td>0</td>
</tr>
<tr>
<td>Syncope</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td><strong>Eye Disorders</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vision disorder&lt;sup&gt;b&lt;/sup&gt;</td>
<td>60</td>
<td>0</td>
</tr>
<tr>
<td><strong>Cardiac Disorders</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electrocardiogram QT prolonged</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Bradycardia&lt;sup&gt;c&lt;/sup&gt;</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td><strong>Investigations</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Decreased weight</td>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td><strong>Gastrointestinal Disorders</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vomiting</td>
<td>47</td>
<td>1</td>
</tr>
<tr>
<td>Nausea</td>
<td>55</td>
<td>1</td>
</tr>
<tr>
<td>Diarrhea</td>
<td>60</td>
<td>0</td>
</tr>
<tr>
<td>Constipation</td>
<td>42</td>
<td>2</td>
</tr>
<tr>
<td>Dyspepsia</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td><strong>Infections and Infestations</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upper respiratory infection&lt;sup&gt;d&lt;/sup&gt;</td>
<td>26</td>
<td>0</td>
</tr>
<tr>
<td><strong>Respiratory, Thoracic and Mediastinal Disorders</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pulmonary embolism&lt;sup&gt;e&lt;/sup&gt;</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td><strong>General Disorders and Administration Site Conditions</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Edema&lt;sup&gt;f&lt;/sup&gt;</td>
<td>31</td>
<td>0</td>
</tr>
</tbody>
</table>

<sup>a</sup> Adverse reactions were graded using NCI CTCAE version 4.0. Includes cases reported within the clustered terms:
- Dizziness (Balance disorder, Dizziness, Postural dizziness).
- Vision Disorder (Diplopia, Photophobia, Photopsia, Blurred vision, Reduced visual acuity, Visual impairment, Vitreous floaters).
- Bradycardia (Bradycardia, Sinus bradycardia).
- Upper respiratory infection (Laryngitis, Nasopharyngitis, Pharyngitis, Rhinitis, Upper respiratory tract infection).
- Pulmonary embolism (Pulmonary artery thrombosis, Pulmonary embolism).
- Edema (Face edema, Generalized edema, Local swelling, Localized edema, Edema, Peripheral edema, Periorbital edema).

Additional adverse reactions occurring at an overall incidence between 1% and 30% in patients treated with XALKORI included decreased appetite (27%), fatigue (27%), neuropathy (19%; dysesthesia, gait disturbance, hypoesthesia, muscular weakness, neuralgia, peripheral neuropathy, paresthesia, peripheral sensory neuropathy, polyneuropathy, burning sensation in skin), rash (9%), ILD (4%; acute respiratory distress syndrome, ILD, pneumonitis), renal cyst (4%), esophagitis (2%), hepatic failure (1%), and decreased blood testosterone (1%; hypogonadism).
Table 6. Laboratory Abnormalities with Grade 3 or 4 Incidence of ≥4% in XALKORI-Treated Patients in Study 2

<table>
<thead>
<tr>
<th>Laboratory Abnormality</th>
<th>XALKORI Any Grade (%)</th>
<th>Grade 3-4 (%)</th>
<th>Chemotherapy Any Grade (%)</th>
<th>Grade 3-4 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hematology</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neutropenia</td>
<td>49</td>
<td>12</td>
<td>28</td>
<td>12</td>
</tr>
<tr>
<td>Lymphopenia</td>
<td>51</td>
<td>9</td>
<td>60</td>
<td>25</td>
</tr>
<tr>
<td>Chemistry</td>
<td></td>
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<td></td>
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<tr>
<td>ALT elevation</td>
<td>76</td>
<td>17</td>
<td>38</td>
<td>4</td>
</tr>
<tr>
<td>AST elevation</td>
<td>61</td>
<td>9</td>
<td>33</td>
<td>0</td>
</tr>
<tr>
<td>Hypokalemia</td>
<td>18</td>
<td>4</td>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td>Hypophosphatemia</td>
<td>28</td>
<td>5</td>
<td>25</td>
<td>6</td>
</tr>
</tbody>
</table>

Additional laboratory test abnormality in patients treated with XALKORI was an increase in creatinine (Any Grade: 96%; Grade 3: 1%; Grade 4: 0%) compared to the chemotherapy arm (Any Grade: 72%; Grade 3: 0%; Grade 4: 0%).

ROS1-Positive Metastatic NSCLC - Study 3

The safety profile of XALKORI from Study 3, which was evaluated in 50 patients with ROS1-positive metastatic NSCLC, was generally consistent with the safety profile of XALKORI evaluated in patients with ALK-positive metastatic NSCLC (n=1669). Vision disorders occurred in 92% of patients in Study 3; 90% were Grade 1 and 2% were Grade 2. The median duration of exposure to XALKORI was 34.4 months.

Description of Selected Adverse Drug Reactions

Vision disorders
Vision disorders, most commonly visual impairment, photopsia, blurred vision, or vitreous floaters, occurred in 1084 (63.1%) of 1719 patients. The majority (95%) of these patients had Grade 1 visual adverse reactions. There were 13 (0.8%) patients with Grade 3 and 4 (0.2%) patients with Grade 4 visual impairment.

Based on the Visual Symptom Assessment Questionnaire (VSAQ-ALK), patients treated with XALKORI in Studies 1 and 2 reported a higher incidence of visual disturbances compared to patients treated with chemotherapy. The onset of vision disorder generally was within the first week of drug administration. The majority of patients on the XALKORI arms in Studies 1 and 2 (>50%) reported visual disturbances which occurred at a frequency of 4-7 days each week, lasted up to 1 minute, and had mild or no impact (scores 0 to 3 out of a maximum score of 10) on daily activities as captured in the VSAQ-ALK questionnaire.

Neuropathy
Neuropathy, most commonly sensory in nature, occurred in 435 (25%) of 1719 patients. Most events (95%) were Grade 1 or Grade 2 in severity.

Renal cysts
Renal cysts were experienced by 52 (3%) of 1719 patients.

The majority of renal cysts in XALKORI-treated patients were complex. Local cystic invasion beyond the kidney occurred, in some cases with imaging characteristics suggestive of abscess formation. However, across clinical trials no renal abscesses were confirmed by microbiology tests.

Renal impairment
The estimated glomerular filtration rate (eGFR) decreased from a baseline median of 96.42 mL/min/1.73 m² (n=1681) to a median of 80.23 mL/min/1.73 m² at 2 weeks (n=1499) in patients with ALK-positive advanced
NSCLC who received XALKORI in clinical trials. No clinically relevant changes occurred in median eGFR from 12 to 104 weeks of treatment. Median eGFR slightly increased (83.02 mL/min/1.73 m²) 4 weeks after the last dose of XALKORI. Overall, 76% of patients had a decrease in eGFR to <90 mL/min/1.73 m², 38% had a decrease to eGFR to <60 mL/min/1.73 m², and 3.6% had a decrease to eGFR to <30 mL/min/1.73 m².

7 DRUG INTERACTIONS

7.1 Drugs That May Increase Crizotinib Plasma Concentrations

Coadministration of crizotinib with strong cytochrome P450 (CYP) 3A inhibitors increases crizotinib plasma concentrations [see Clinical Pharmacology (12.3)]. Avoid concomitant use of strong CYP3A inhibitors, including but not limited to atazanavir, clarithromycin, indinavir, itraconazole, ketoconazole, nefazodone, nelfinavir, ritonavir, saquinavir, telithromycin, troleandomycin, and voriconazole. Avoid grapefruit or grapefruit juice which may also increase plasma concentrations of crizotinib. Exercise caution with concomitant use of moderate CYP3A inhibitors.

7.2 Drugs That May Decrease Crizotinib Plasma Concentrations

Coadministration of crizotinib with strong CYP3A inducers decreases crizotinib plasma concentrations [see Clinical Pharmacology (12.3)]. Avoid concomitant use of strong CYP3A inducers, including but not limited to carbamazepine, phenobarbital, phenytoin, rifabutin, rifampin, and St. John’s Wort.

7.3 Drugs Whose Plasma Concentrations May Be Altered By Crizotinib

Crizotinib inhibits CYP3A both in vitro and in vivo [see Clinical Pharmacology (12.3)]. Avoid concomitant use of CYP3A substrates with narrow therapeutic range, including but not limited to alfentanil, cyclosporine, dihydroergotamine, ergotamine, fentanyl, pimozide, quinidine, sirolimus, and tacrolimus in patients taking XALKORI. If concomitant use of these CYP3A substrates with narrow therapeutic range is required in patients taking XALKORI, dose reductions of the CYP3A substrates may be required due to adverse reactions.

8 USE IN SPECIFIC POPULATIONS

8.1 Pregnancy

Risk Summary

Based on its mechanism of action, XALKORI can cause fetal harm when administered to a pregnant woman [see Clinical Pharmacology (12.1)]. There are no available data on the use of XALKORI during pregnancy. In animal reproduction studies, oral administration of crizotinib in pregnant rats during organogenesis at exposures similar to those expected with the maximum recommended human dose resulted in embryotoxicity and fetotoxicity [see Data]. Advise pregnant women of the potential risk to a fetus.

The estimated background risk of major birth defects and miscarriage for the indicated population is unknown. In the U.S. general population, the estimated background risk of major birth defects and miscarriage in clinically recognized pregnancies is 2 to 4% and 15 to 20%, respectively.
Data

Animal Data

Crizotinib was administered to pregnant rats and rabbits during organogenesis to study the effects on embryo-fetal development. Postimplantation loss was increased at doses ≥50 mg/kg/day (approximately 0.6 times the recommended human dose based on AUC) in rats. No teratogenic effects were observed in rats at doses up to the maternally toxic dose of 200 mg/kg/day (approximately 2.7 times the recommended human dose based on AUC) or in rabbits at doses of up to 60 mg/kg/day (approximately 1.6 times the recommended human dose based on AUC), though fetal body weights were reduced at these doses.

8.2 Lactation

Risk Summary

There is no information regarding the presence of crizotinib in human milk, the effects on the breastfed infant, or the effects on milk production. Because of the potential for adverse reactions in breastfed infants, do not breastfeed during treatment with XALKORI and for 45 days after the final dose.

8.3 Females and Males of Reproductive Potential

Contraception

Females

XALKORI can cause fetal harm when administered to a pregnant woman [see Use in Specific Populations (8.1)]. Advise females of reproductive potential to use effective contraception during treatment with XALKORI and for at least 45 days after the final dose.

Males

Because of the potential for genotoxicity, advise males with female partners of reproductive potential to use condoms during treatment with XALKORI and for at least 90 days after the final dose [see Nonclinical Toxicology (13.1)].

Infertility

Based on reproductive organ findings in animals, XALKORI may cause reduced fertility in females and males of reproductive potential. It is not known whether these effects on fertility are reversible [see Nonclinical Toxicology (13.1)].

8.4 Pediatric Use

The safety and efficacy of XALKORI in pediatric patients has not been established.

Animal Data

Decreased bone formation in growing long bones was observed in immature rats at 150 mg/kg/day following once daily dosing for 28 days (approximately 5.4 times the recommended human dose based on AUC). Other toxicities of potential concern to pediatric patients have not been evaluated in juvenile animals.
8.5 Geriatric Use

Of the total number of patients with ALK-positive metastatic NSCLC in clinical studies of XALKORI (n=1669), 16% were 65 years or older and 3.8% were 75 years or older. No overall differences in safety or effectiveness were observed between these patients and younger patients.

Clinical studies of XALKORI in patients with ROS1-positive metastatic NSCLC did not include sufficient numbers of patients age 65 years and older to determine whether they respond differently from younger patients.

8.6 Hepatic Impairment

XALKORI has not been studied in patients with hepatic impairment. As crizotinib is extensively metabolized in the liver, hepatic impairment is likely to increase plasma crizotinib concentrations. Clinical studies excluded patients with AST or ALT greater than 2.5 times ULN, or greater than 5 times ULN, if due to liver metastases. Patients with total bilirubin greater than 1.5 times ULN were also excluded. Therefore, use caution in patients with hepatic impairment [see Clinical Pharmacology (12.3)].

8.7 Renal Impairment

No starting dose adjustment is needed for patients with mild (CL\textsubscript{cr} 60-89 mL/min) or moderate (CL\textsubscript{cr} 30-59 mL/min) renal impairment based on a population pharmacokinetic analysis.

Increased exposure to crizotinib occurred in patients with severe renal impairment (CL\textsubscript{cr} <30 mL/min) not requiring dialysis. Administer XALKORI at a dose of 250 mg taken orally once daily in patients with severe renal impairment not requiring dialysis [see Dosage and Administration (2.2) and Clinical Pharmacology (12.3)].

10 OVERDOSAGE

There have been no known cases of XALKORI overdose. There is no antidote for XALKORI.

11 DESCRIPTION

XALKORI (crizotinib) is an oral receptor tyrosine kinase inhibitor. The molecular formula for crizotinib is C\textsubscript{21}H\textsubscript{22}Cl\textsubscript{2}FN\textsubscript{5}O. The molecular weight is 450.34 daltons. Crizotinib is described chemically as (R)-3-[1-(2,6-Dichloro-3-fluorophenyl)ethoxy]-5-[1-(piperidin-4-yl)-1\textit{H}-pyrazol-4-yl]pyridin-2-amine.
The chemical structure of crizotinib is shown below:

Crizotinib is a white to pale-yellow powder with a pKa of 9.4 (piperidinium cation) and 5.6 (pyridinium cation). The solubility of crizotinib in aqueous media decreases over the range pH 1.6 to pH 8.2 from greater than 10 mg/mL to less than 0.1 mg/mL. The log of the distribution coefficient (octanol/water) at pH 7.4 is 1.65.

XALKORI capsules are supplied as printed hard-shell capsules containing 250 mg or 200 mg of crizotinib together with colloidal silicon dioxide, microcrystalline cellulose, anhydrous dibasic calcium phosphate, sodium starch glycolate, magnesium stearate, and hard gelatin capsule shells as inactive ingredients.

The pink opaque capsule shell components contain gelatin, titanium dioxide, and red iron oxide. The white opaque capsule shell components contain gelatin and titanium dioxide. The printing ink contains shellac, propylene glycol, strong ammonia solution, potassium hydroxide, and black iron oxide.

12 CLINICAL PHARMACOLOGY

12.1 Mechanism of Action

Crizotinib is an inhibitor of receptor tyrosine kinases including ALK, Hepatocyte Growth Factor Receptor (HGFR, c-Met), ROS1 (c-ros), and Recepteur d’Origine Nantais (RON). Translocations can affect the ALK gene resulting in the expression of oncogenic fusion proteins. The formation of ALK fusion proteins results in activation and dysregulation of the gene’s expression and signaling which can contribute to increased cell proliferation and survival in tumors expressing these proteins. Crizotinib demonstrated concentration-dependent inhibition of ALK, ROS1, and c-Met phosphorylation in cell-based assays using tumor cell lines and demonstrated antitumor activity in mice bearing tumor xenografts that expressed echinoderm microtubule-associated protein-like 4 (EML4)- or nucleophosmin (NPM)-ALK fusion proteins or c-Met.

12.2 Pharmacodynamics

Cardiac electrophysiology

In an ECG substudy conducted in 52 patients with ALK-positive NSCLC who received crizotinib 250 mg twice daily, the maximum mean QTcF (corrected QT by the Fridericia method) change from baseline was 12.3 ms (2-sided 90% upper CI: 19.5 ms). An exposure-QT analysis suggested a crizotinib plasma concentration-dependent increase in QTcF [see Warnings and Precautions (5.3)].
12.3 Pharmacokinetics

Absorption

Following a single oral dose, crizotinib was absorbed with median time to achieve peak concentration of 4 to 6 hours. Following crizotinib 250 mg twice daily, steady state was reached within 15 days and remained stable, with a median accumulation ratio of 4.8. Steady-state systemic exposure [observed minimum concentration ($C_{\text{min}}$) and AUC] appeared to increase in a greater than dose-proportional manner over the dose range of 200-300 mg twice daily.

The mean absolute bioavailability of crizotinib was 43% (range: 32% to 66%) following a single 250 mg oral dose.

A high-fat meal reduced crizotinib AUC from time zero to infinity (AUC$_{\text{inf}}$) and maximum observed plasma concentration ($C_{\text{max}}$) by approximately 14%. XALKORI can be administered with or without food [see Dosage and Administration (2.2)].

Distribution

The geometric mean volume of distribution ($V_{\text{ss}}$) of crizotinib was 1772 L following intravenous administration of a 50 mg dose, indicating extensive distribution into tissues from the plasma.

Binding of crizotinib to human plasma proteins in vitro is 91% and is independent of drug concentration. In vitro studies suggested that crizotinib is a substrate for P-glycoprotein (P-gp). The blood-to-plasma concentration ratio is approximately 1.

Elimination

Following single doses of crizotinib, the mean apparent plasma terminal half-life of crizotinib was 42 hours in patients.

Following the administration of a single 250 mg radiolabeled crizotinib dose to healthy subjects, 63% and 22% of the administered dose was recovered in feces and urine, respectively. Unchanged crizotinib represented approximately 53% and 2.3% of the administered dose in feces and urine, respectively.

The mean apparent clearance (CL/F) of crizotinib was lower at steady state (60 L/h) after 250 mg twice daily than after a single 250 mg oral dose (100 L/h), which was likely due to autoinhibition of CYP3A by crizotinib after multiple dosing.

Metabolism

Crizotinib is predominantly metabolized by CYP3A4/5. The primary metabolic pathways in humans were oxidation of the piperidine ring to crizotinib lactam and O-dealkylation, with subsequent Phase 2 conjugation of O-dealkylated metabolites.

Specific populations

Hepatic impairment: As crizotinib is extensively metabolized in the liver, hepatic impairment is likely to increase plasma crizotinib concentrations. However, XALKORI has not been studied in patients with hepatic impairment. Clinical studies excluded patients with ALT or AST greater than 2.5 times ULN or greater than...
5 times ULN if due to liver metastases. Patients with total bilirubin greater than 1.5 times ULN were also excluded [see Use in Specific Populations (8.6)]. The population pharmacokinetic analysis using the data from approximately 1200 patients with cancer who received XALKORI suggested that baseline total bilirubin (0.1 to 2.1 mg/dL) or AST levels (7 to 124 U/L) did not have a clinically relevant effect on the exposure of crizotinib.

Renal impairment: The pharmacokinetics of crizotinib were evaluated using the population pharmacokinetic analysis in patients with mild (CL\text{cr} 60-89 mL/min, n=433) and moderate (CL\text{cr} 30-59 mL/min, n=137) renal impairment. Mild or moderate renal impairment has no clinically relevant effect on the exposure of crizotinib.

A study was conducted in 7 patients with severe renal impairment (CL\text{cr} <30 mL/min) who did not require dialysis and 8 patients with normal renal function (CL\text{cr} ≥90 mL/min). All patients received a single 250 mg oral dose of XALKORI. The mean AUC\text{inf} for crizotinib increased by 79% and the mean C\text{max} increased by 34% in patients with severe renal impairment compared to those with normal renal function. Similar changes in AUC\text{inf} and C\text{max} were observed for the active metabolite of crizotinib [see Dosage and Administration (2.2) and Use in Specific Populations (8.7)].

Ethnicity: No clinically relevant difference in the exposure of crizotinib between Asian patients (n=523) and non-Asian patients (n=691).

Age: Age has no effect on the exposure of crizotinib based on the population pharmacokinetic analysis.

Body weight and gender: No clinically relevant effect of body weight or gender on the exposure of crizotinib based on the population pharmacokinetic analysis.

Drug interactions

Effect of Other Drugs on Crizotinib

Strong CYP3A inhibitors: Coadministration of a single 150 mg oral dose of crizotinib with ketoconazole (200 mg twice daily), a strong CYP3A inhibitor, increased crizotinib AUC\text{inf} and C\text{max} values by approximately 3.2-fold and 1.4-fold, respectively, compared to crizotinib alone. However, the magnitude of effect of CYP3A inhibitors on steady-state crizotinib exposure has not been evaluated [see Drug Interactions (7.1)].

Strong CYP3A inducers: Coadministration of crizotinib (250 mg twice daily) with rifampin (600 mg once daily), a strong CYP3A inducer, decreased crizotinib steady-state AUC\text{tau} and C\text{max} by 84% and 79%, respectively, compared to crizotinib alone [see Drug Interactions (7.2)].

Gastric pH elevating medications: In healthy subjects, coadministration of a single 250 mg oral dose of crizotinib following administration of esomeprazole 40 mg daily for 5 days did not result in a clinically relevant change in crizotinib exposure (AUC\text{inf} decreased by 10% and no change in C\text{max}).

Effect of Crizotinib on Other Drugs

CYP3A substrates: Coadministration of crizotinib (250 mg twice daily for 28 days) in patients increased the AUC\text{inf} of oral midazolam 3.7-fold compared to midazolam alone, suggesting that crizotinib is a moderate inhibitor of CYP3A [see Drug Interactions (7.3)].

Other CYP substrates: In vitro studies suggest that clinical drug-drug interactions as a result of crizotinib-mediated inhibition of the metabolism of substrates for CYP1A2, CYP2C8, CYP2C9, CYP2C19, or CYP2D6 are unlikely to occur.
Crizotinib is an inhibitor of CYP2B6 in vitro. Therefore, crizotinib may increase plasma concentrations of coadministered drugs that are predominantly metabolized by CYP2B6.

An in vitro study suggests that clinical drug-drug interactions as a result of crizotinib-mediated induction of the metabolism of substrates for CYP1A2, CYP2B6, CYP2C8, CYP2C9, CYP2C19, or CYP3A are unlikely to occur.

*UGT substrates*: In vitro studies suggest that clinical drug-drug interactions as a result of crizotinib-mediated inhibition of the metabolism of drugs that are substrates for uridine diphosphate glucuronosyltransferase (UGT)1A1, UGT1A4, UGT1A6, UGT1A9 or UGT2B7 are unlikely to occur.

*Substrates of transporters*: Crizotinib inhibited P-gp in vitro at clinically relevant concentrations. Therefore, crizotinib has the potential to increase plasma concentrations of coadministered drugs that are substrates of P-gp.

Crizotinib inhibited the hepatic uptake transporter, organic cation transporter (OCT) 1, and renal uptake transporter, OCT2, in vitro at clinically relevant concentrations. Therefore, crizotinib has the potential to increase plasma concentrations of coadministered drugs that are substrates of OCT1 or OCT2.

Crizotinib did not inhibit the human hepatic uptake transport proteins, organic anion transporting polypeptides (OATP) B1 or OATP1B3, or the renal uptake transport proteins organic anion transporter (OAT) 1 or OAT3 in vitro at clinically relevant concentrations.

*Other transporters*: Crizotinib did not inhibit the hepatic efflux bile salt export pump transporter (BSEP) in vitro at clinically relevant concentrations.

13 **NONCLINICAL TOXICOLOGY**

13.1 **Carcinogenesis, Mutagenesis, Impairment of Fertility**

Carcinogenicity studies with crizotinib have not been conducted.

Crizotinib was genotoxic in an in vitro micronucleus assay in Chinese Hamster Ovary cultures, in an in vitro human lymphocyte chromosome aberration assay, and in in vivo rat bone marrow micronucleus assays. Crizotinib was not mutagenic in vitro in the bacterial reverse mutation (Ames) assay.

No specific studies with crizotinib have been conducted in animals to evaluate the effect on fertility; however, crizotinib is considered to have the potential to impair reproductive function and fertility in humans based on findings in repeat-dose toxicity studies in the rat. Findings observed in the male reproductive tract included testicular pachytene spermatocyte degeneration in rats given greater than or equal to 50 mg/kg/day for 28 days (greater than 1.7 times the recommended human dose based on AUC). Findings observed in the female reproductive tract included single-cell necrosis of ovarian follicles of a rat given 500 mg/kg/day (approximately 10 times the recommended human dose based on body surface area) for 3 days.
14 CLINICAL STUDIES

14.1 ALK-Positive Metastatic NSCLC

Previously Untreated ALK-Positive Metastatic NSCLC - Study 1

The efficacy and safety of XALKORI for the treatment of patients with ALK-positive metastatic NSCLC, who had not received previous systemic treatment for advanced disease, was demonstrated in a randomized, multicenter, open-label, active-controlled study (Study 1). Patients were required to have ALK-positive NSCLC as identified by the FDA-approved assay, Vysis ALK Break-Apart fluorescence in situ hybridization (FISH) Probe Kit, prior to randomization. The major efficacy outcome measure was progression-free survival (PFS) according to Response Evaluation Criteria in Solid Tumors (RECIST) version 1.1 as assessed by independent radiology review (IRR) committee. Additional efficacy outcome measures included objective response rate (ORR) as assessed by IRR, duration of response (DOR), and overall survival (OS). Patient-reported lung cancer symptoms were assessed at baseline and periodically during treatment.

Patients were randomized to receive XALKORI (n=172) or chemotherapy (n=171). Randomization was stratified by Eastern Cooperative Oncology Group (ECOG) performance status (0-1, 2), race (Asian, non-Asian), and brain metastases (present, absent). Patients in the XALKORI arm received XALKORI 250 mg orally twice daily until documented disease progression, intolerance to therapy, or the investigator determined that the patient was no longer experiencing clinical benefit. Chemotherapy consisted of pemetrexed 500 mg/m$^2$ with cisplatin 75 mg/m$^2$ or carboplatin AUC of 5 or 6 mg·min/mL by intravenous infusion every 3 weeks for up to 6 cycles. Patients in the chemotherapy arm were not permitted to receive maintenance chemotherapy. At the time of documented disease progression, as per independent radiology review, patients randomized to chemotherapy were offered XALKORI.

The demographic characteristics of the overall study population were 62% female, median age of 53 years, baseline ECOG performance status 0 or 1 (95%), 51% White and 46% Asian, 4% current smokers, 32% past smokers, and 64% never smokers. The disease characteristics of the overall study population were metastatic disease in 98% of patients, 92% of patients’ tumors were classified as adenocarcinoma histology, 27% of patients had brain metastases, and 7% received systemic chemotherapy as adjuvant or neoadjuvant therapy. Of those randomized to chemotherapy, 70% received XALKORI after IRR documented progression.

Study 1 demonstrated a statistically significant improvement in PFS in the patients treated with XALKORI. The OS analysis conducted at the time of the PFS analysis did not suggest a difference in survival between arms. Table 7 and Figure 1 summarize the efficacy results. Exploratory patient-reported symptom measures of baseline and post-treatment dyspnea, cough, and chest pain suggested a delay in time to development of or worsening of dyspnea, but not cough or chest pain, in patients treated with XALKORI as compared to chemotherapy. The patient-reported delay in onset or worsening of dyspnea may be an overestimation, because patients were not blinded to treatment assignment.
### Table 7. Previously Untreated ALK-Positive Metastatic NSCLC - Efficacy Results

<table>
<thead>
<tr>
<th></th>
<th>XALKORI (N=172)</th>
<th>Chemotherapy (N=171)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Progression-Free Survival (Based on IRR)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Events (%)</td>
<td>100 (58%)</td>
<td>137 (80%)</td>
</tr>
<tr>
<td>Progressive Disease</td>
<td>89 (52%)</td>
<td>132 (77%)</td>
</tr>
<tr>
<td>Death</td>
<td>11 (6%)</td>
<td>5 (3%)</td>
</tr>
<tr>
<td>Median, Months (95% CI)</td>
<td>10.9 (8.3, 13.9)</td>
<td>7.0 (6.8, 8.2)</td>
</tr>
<tr>
<td>HR (95% CI)&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.45 (0.35, 0.60)</td>
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<tr>
<td>p-value&lt;sup&gt;b&lt;/sup&gt;</td>
<td>&lt;0.001</td>
<td></td>
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<tr>
<td><strong>Overall Survival</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Events (%)</td>
<td>44 (26%)</td>
<td>46 (27%)</td>
</tr>
<tr>
<td>Median, Months (95% CI)</td>
<td>NR</td>
<td>NR</td>
</tr>
<tr>
<td>HR (95% CI)&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.82 (0.54, 1.26)</td>
<td></td>
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<tr>
<td>p-value&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.36</td>
<td></td>
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<tr>
<td><strong>Tumor Responses (Based on IRR)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Objective Response Rate % (95% CI)</td>
<td>74% (67, 81)</td>
<td>45% (37, 53)</td>
</tr>
<tr>
<td>CR, n (%)</td>
<td>3 (1.7%)</td>
<td>2 (1.2%)</td>
</tr>
<tr>
<td>PR, n (%)</td>
<td>125 (73%)</td>
<td>75 (44%)</td>
</tr>
<tr>
<td>p-value&lt;sup&gt;c&lt;/sup&gt;</td>
<td>&lt;0.001</td>
<td></td>
</tr>
<tr>
<td><strong>Duration of Response</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Median, Months (95% CI)</td>
<td>11.3 (8.1, 13.8)</td>
<td>5.3 (4.1, 5.8)</td>
</tr>
</tbody>
</table>

HR=hazard ratio; CI=confidence interval; IRR=independent radiology review; NR=not reached; CR=complete response; PR=partial response.

<sup>a</sup> Based on the Cox proportional hazards stratified analysis.

<sup>b</sup> Based on the stratified log-rank test.

<sup>c</sup> Based on the stratified Cochran-Mantel-Haenszel test.

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**Figure 1. Kaplan-Meier Curves of Progression-Free Survival as Assessed by IRR in Study 1**
Previously Treated ALK-Positive Metastatic NSCLC - Study 2

The efficacy and safety of XALKORI as monotherapy for the treatment of 347 patients with ALK-positive metastatic NSCLC, previously treated with 1 platinum-based chemotherapy regimen, were demonstrated in a randomized, multicenter, open-label, active-controlled study (Study 2). The major efficacy outcome was PFS according to RECIST version 1.1 as assessed by IRR. Additional efficacy outcomes included ORR as assessed by IRR, DOR, and OS.

Patients were randomized to receive XALKORI 250 mg orally twice daily (n=173) or chemotherapy (n=174). Chemotherapy consisted of pemetrexed 500 mg/m\(^2\) (if pemetrexed-naïve; n=99) or docetaxel 75 mg/m\(^2\) (n=72) intravenously (IV) every 21 days. Patients in both treatment arms continued treatment until documented disease progression, intolerance to therapy, or the investigator determined that the patient was no longer experiencing clinical benefit. Randomization was stratified by ECOG performance status (0-1, 2), brain metastases (present, absent), and prior EGFR tyrosine kinase inhibitor treatment (yes, no). Patients were required to have ALK-positive NSCLC as identified by the FDA-approved assay, Vysis ALK Break-Apart FISH Probe Kit, prior to randomization. At the time of the final analysis of overall survival, 154 (89%) patients randomized to the chemotherapy arm subsequently received XALKORI.

The demographic characteristics of the overall study population were 56% female, median age of 50 years, baseline ECOG performance status 0 or 1 (90%), 52% White and 45% Asian, 4% current smokers, 33% past smokers, and 63% never smokers. The disease characteristics of the overall study population were metastatic disease in at least 95% of patients and at least 93% of patients’ tumors were classified as adenocarcinoma histology.

Study 2 demonstrated a statistically significant improvement in PFS in the patients treated with XALKORI. Table 8 and Figure 2 summarize the efficacy results.
Table 8. Previously Treated ALK-Positive Metastatic NSCLC - Efficacy Results

<table>
<thead>
<tr>
<th></th>
<th>XALKORI (N=173)</th>
<th>Chemotherapy (N=174)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Progression-Free Survival (Based on IRR)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Events (%)</td>
<td>100 (58%)</td>
<td>127 (73%)</td>
</tr>
<tr>
<td>Progressive Disease</td>
<td>84 (49%)</td>
<td>119 (68%)</td>
</tr>
<tr>
<td>Death</td>
<td>16 (9%)</td>
<td>8 (5%)</td>
</tr>
<tr>
<td>Median, Months (95% CI)</td>
<td>7.7 (6.0, 8.8)</td>
<td>3.0&lt;sup&gt;a&lt;/sup&gt; (2.6, 4.3)</td>
</tr>
<tr>
<td>HR (95% CI)&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.49 (0.37, 0.64)</td>
<td></td>
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<tr>
<td>p-value&lt;sup&gt;c&lt;/sup&gt;</td>
<td></td>
<td>&lt;0.001</td>
</tr>
<tr>
<td><strong>Overall Survival</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Events (%)</td>
<td>116 (67%)</td>
<td>126 (72%)</td>
</tr>
<tr>
<td>Median, Months (95% CI)</td>
<td>21.7 (18.9,30.5)</td>
<td>21.9 (16.8,26.0)</td>
</tr>
<tr>
<td>HR (95% CI)&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.85 (0.66, 1.10)</td>
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<tr>
<td>p-value&lt;sup&gt;c&lt;/sup&gt;</td>
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<td>0.229</td>
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<tr>
<td><strong>Tumor Responses (Based on IRR)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Objective Response Rate % (95% CI)</td>
<td>65% (58, 72)</td>
<td>20% (14, 26)</td>
</tr>
<tr>
<td>CR, n (%)</td>
<td>1 (0.6%)</td>
<td>0</td>
</tr>
<tr>
<td>PR, n (%)</td>
<td>112 (65%)</td>
<td>34 (20%)</td>
</tr>
<tr>
<td>p-value&lt;sup&gt;d&lt;/sup&gt;</td>
<td></td>
<td>&lt;0.001</td>
</tr>
<tr>
<td><strong>Duration of Response</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Median, Months (95% CI)</td>
<td>7.4 (6.1, 9.7)</td>
<td>5.6 (3.4, 8.3)</td>
</tr>
</tbody>
</table>

HR=hazard ratio; CI=confidence interval; IRR=independent radiology review; CR=complete response; PR=partial response.

<sup>a</sup> For pemetrexed, the median PFS was 4.2 months. For docetaxel, the median PFS was 2.6 months.

<sup>b</sup> Based on the Cox proportional hazards stratified analysis.

<sup>c</sup> Based on the stratified log-rank test.

<sup>d</sup> Based on the stratified Cochran-Mantel-Haenszel test.
14.2 ROS1-Positive Metastatic NSCLC

The efficacy and safety of XALKORI was investigated in a multicenter, single-arm study (Study 3), in which patients with ROS1-positive metastatic NSCLC received XALKORI 250 mg orally twice daily. Patients were required to have histologically-confirmed advanced NSCLC with a ROS1 rearrangement, age 18 years or older, ECOG performance status of 0, 1, or 2, adequate organ function, and measurable disease. The efficacy outcome measures were ORR and DOR according to RECIST version 1.0 as assessed by IRR and investigator, with imaging performed every 8 weeks for the first 60 weeks.

Baseline demographic and disease characteristics were female (56%), median age of 53 years, baseline ECOG performance status of 0 or 1 (98%), White (54%), Asian (42%), past smokers (22%), never smokers (78%), metastatic disease (92%), adenocarcinoma (96%), no prior systemic therapy for metastatic disease (14%), and prior platinum-based chemotherapy for metastatic disease (80%). The ROS1 status of NSCLC tissue samples was determined by laboratory-developed break-apart FISH (96%) or RT-PCR (4%) clinical trial assays. For assessment by FISH, ROS1 positivity required that ≥15% of a minimum of 50 evaluated nuclei contained a ROS1 gene rearrangement.

Efficacy results are summarized in Table 9.
Table 9. ROS1-Positive Metastatic NSCLC - Efficacy Results*

<table>
<thead>
<tr>
<th>Efficacy Parameters</th>
<th>IRR (N=50)</th>
<th>Investigator-Assessed (N=50)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objective Response Rate (95% CI)</td>
<td>66% (51, 79)</td>
<td>72% (58, 84)</td>
</tr>
<tr>
<td>Complete Response, n</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Partial Response, n</td>
<td>32</td>
<td>31</td>
</tr>
<tr>
<td>Duration of Response</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Median, Months (95% CI)</td>
<td>18.3 (12.7, NR)</td>
<td>NR (14.5, NR)</td>
</tr>
</tbody>
</table>

IRR=independent radiology review; CI=confidence interval; NR=not reached.
*As assessed by RECIST version 1.0.

16 HOW SUPPLIED/STORAGE AND HANDLING

- 250 mg capsules
  Hard gelatin capsule with pink opaque cap and body, printed with black ink “Pfizer” on the cap, “CRZ 250” on the body; available in:
  Bottles of 60 capsules: NDC 0069-8140-20

- 200 mg capsules
  Hard gelatin capsule with pink opaque cap and white opaque body, printed with black ink “Pfizer” on the cap, “CRZ 200” on the body; available in:
  Bottles of 60 capsules: NDC 0069-8141-20

Store at room temperature 20° to 25°C (68° to 77°F); excursions permitted between 15° to 30°C (59° to 86°F) [see USP Controlled Room Temperature].

17 PATIENT COUNSELING INFORMATION

Advise the patient to read the FDA-approved patient labeling (Patient Information).

Hepatotoxicity
Inform patients to immediately report symptoms of hepatotoxicity [see Warnings and Precautions (5.1)].

Interstitial Lung Disease (Pneumonitis)
Advise patients to immediately report any new or worsening pulmonary symptoms [see Warnings and Precautions (5.2)].

Bradycardia
Advise patients to report any symptoms of bradycardia and to inform their healthcare provider about the use of any heart or blood pressure medications [see Warnings and Precautions (5.4)].

Severe Visual Loss
Inform patients of the potential risk of severe visual loss and to immediately contact their healthcare provider if they develop severe visual loss. Inform patients that visual changes such as perceived flashes of light, blurry vision, light sensitivity, and floaters are commonly reported adverse events and may occur while driving or operating machinery. The onset of visual disorders most commonly occurs during the first week of treatment [see Warnings and Precautions (5.5) and Adverse Reactions (6)].
Drug Interactions
Inform patients to avoid grapefruit or grapefruit juice while taking XALKORI. Advise patients to inform their healthcare providers of all concomitant medications, including prescription medicines, over-the-counter drugs, vitamins, and herbal products [see Drug Interactions (7)].

Dosing and Administration
Advise patients to take XALKORI with or without food and swallow XALKORI capsules whole.

If a patient misses a dose, advise the patient to take it as soon as remembered unless it is less than 6 hours until the next dose, in which case, advise the patient not to take the missed dose. If a patient vomits after taking a dose of XALKORI, advise the patient not to take an extra dose, but to take the next dose at the regular time.

Embryo-Fetal Toxicity
Advise females of reproductive potential of the potential risk to a fetus and to inform their healthcare provider of a known or suspected pregnancy [see Warnings and Precautions (5.6) and Use in Specific Populations (8.1)]. Advise females of reproductive potential to use effective contraception during treatment with XALKORI and for at least 45 days after the final dose [see Use in Specific Populations (8.3)].

Females and Males of Reproductive Potential
Advise females and males of reproductive potential of the potential for reduced fertility from XALKORI [see Use in Specific Populations (8.3) and Nonclinical Toxicology (13.1)].

Advise male patients with female partners of reproductive potential to use condoms during treatment with XALKORI and for at least 90 days after the final dose [see Use in Specific Populations (8.3) and Nonclinical Toxicology (13.1)].

Lactation
Advise females not to breastfeed during treatment with XALKORI and for 45 days after the final dose [see Use in Specific Populations (8.2)].

Infertility
Advise females and males of reproductive potential of the potential for reduced fertility from XALKORI [see Use in Specific Populations (8.3)].

This product’s labeling may have been updated. For full prescribing information, please visit www.XALKORI.com.

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LAB-0440-18.0
What is the most important information I should know about XALKORI?

XALKORI may cause serious side effects, including:

- **Liver problems.** XALKORI may cause life-threatening liver injury that may lead to death. Your healthcare provider should do blood tests at least every month to check your liver during treatment with XALKORI. Tell your healthcare provider right away if you get any of the following new or worsening symptoms:
  - yellowing of your skin or the white part of your eyes
  - severe tiredness
  - dark or brown (tea color) urine
  - nausea or vomiting
  - decreased appetite
  - pain on the right side of your stomach
  - bleed or bruise more easily than normal
  - itching

- **Lung problems (pneumonitis).** XALKORI may cause life-threatening lung problems that may lead to death. Symptoms may be similar to those symptoms from lung cancer. Tell your healthcare provider right away if you have any new or worsening symptoms, including:
  - trouble breathing or shortness of breath
  - cough with or without mucous
  - fever
  - fever
  - cough with or without mucous
  - fever

- **Heart problems.** XALKORI may cause very slow, very fast, or abnormal heartbeats. Your healthcare provider may check your heart during treatment with XALKORI. Tell your healthcare provider right away if you feel dizzy or faint or have abnormal heartbeats. Tell your healthcare provider if you take any heart or blood pressure medicines.

- **Vision problems.** Vision problems are common with XALKORI. These problems usually happen within 1 week of starting treatment with XALKORI. Vision problems with XALKORI can be severe and may cause partial or complete loss of vision in one or both eyes. Your healthcare provider may stop XALKORI and refer you to an eye healthcare provider if you develop severe vision problems during treatment with XALKORI. Tell your healthcare provider right away if you have any loss of vision or any change in vision, including:
  - double vision
  - seeing flashes of light
  - blurry vision
  - light hurting your eyes
  - new or increased floaters

- **See “What are possible side effects of XALKORI?” for more information about side effects.**

What is XALKORI?

XALKORI is a prescription medicine that is used to treat people with non-small cell lung cancer (NSCLC) that has spread to other parts of the body and is caused by a defect in either a gene called ALK (anaplastic lymphoma kinase) or a gene called ROS1.

It is not known if XALKORI is safe and effective in children.

What should I tell my healthcare provider before taking XALKORI?

Before you take XALKORI, tell your healthcare provider if you:

- have heart problems, including a condition called long QT syndrome
- have liver or kidney problems
- have vision or eye problems
- have any other medical conditions
- are pregnant, or plan to become pregnant. XALKORI can harm your unborn baby.
  - Females who are able to become pregnant should use effective birth control during treatment with XALKORI and for at least 45 days after the final dose of XALKORI.
  - Males who have female partners who can become pregnant should use condoms during treatment with XALKORI and for at least 90 days after the final dose of XALKORI.
  - Talk to your healthcare provider about birth control methods that may be right for you.
  - If you or your partner becomes pregnant, tell your healthcare provider right away.
- are breastfeeding or plan to breastfeed. It is not known if XALKORI passes into your breast milk. Do not breastfeed during treatment with XALKORI and for 45 days after the final dose. Talk to your healthcare provider about the best way to feed your baby during this time.

Tell your healthcare provider about the medicines you take, including prescription medicines, over-the-counter
medicines, vitamins, and herbal supplements.

### How should I take XALKORI?
- Take XALKORI exactly as your healthcare provider tells you.
- Swallow XALKORI capsules whole.
- You may take XALKORI with or without food.
- Your healthcare provider may change your dose, temporarily stop, or permanently stop treatment with XALKORI if you have certain side effects. Do not change your dose or stop taking XALKORI unless your healthcare provider tells you.
- If you miss a dose, take it as soon as you remember. If it is close to your next dose (within 6 hours), just take your next dose at your regular time.
- If you vomit after taking a dose of XALKORI, do not take an extra dose, just take your next dose at your regular time.

### What should I avoid while taking XALKORI?
- You should not drink grapefruit juice or eat grapefruit during your treatment with XALKORI. It may increase the amount of XALKORI in your blood to a harmful level.
- XALKORI can cause changes in your vision, dizziness, and tiredness. If you have these symptoms avoid driving a car, using machinery, or doing anything that needs you to be alert.

### What are the possible side effects of XALKORI?
XALKORI may cause serious side effects, including:
- See “What is the most important information I should know about XALKORI?”

The most common side effects of XALKORI include:
- vision problems. See “What is the most important information I should know about XALKORI?”
- nausea
- diarrhea
- vomiting
- swelling of your hands, feet, face, and eyes
- constipation
- increased liver function blood test results. See “What is the most important information I should know about XALKORI?”
- tiredness
- decreased appetite
- upper respiratory infection
- dizziness
- feeling of numbness or tingling in the extremities

XALKORI may cause decreased fertility in females and males. In females, this could affect your ability to become pregnant. In males, this could affect your ability to father a child. Talk to your healthcare provider if you have concerns about fertility.

Tell your healthcare provider if you have any side effect that bothers you or that does not go away.
These are not all of the possible side effects of XALKORI. For more information, ask your healthcare provider or pharmacist.

Call your doctor for medical advice about side effects. You may report side effects to FDA at 1-800-FDA-1088.

### How should I store XALKORI?
- Store XALKORI at room temperature between 68°F to 77°F (20°C to 25°C).

Keep XALKORI and all medicines out of the reach of children.

### General information about XALKORI
Medicines are sometimes prescribed for purposes other than those listed in a Patient Information leaflet. Do not use XALKORI for a condition for which it was not prescribed. Do not give XALKORI to other people, even if they have the same symptoms that you have. It may harm them. You can ask your healthcare provider or pharmacist for more information about XALKORI that is written for health professionals.
What are the ingredients in XALKORI?

**Active ingredient:** crizotinib

**Inactive ingredients:** colloidal silicon dioxide, microcrystalline cellulose, anhydrous dibasic calcium phosphate, sodium starch glycolate, and magnesium stearate.

Pink opaque capsule shell contains: gelatin, titanium dioxide, and red iron oxide.

White opaque capsule shell contains: gelatin and titanium dioxide.

Printing ink contains: shellac, propylene glycol, strong ammonia solution, potassium hydroxide, and black iron oxide.

For more information, go to [www.XALKORI.com](http://www.XALKORI.com).

LAB-0441-8.0

This Patient Information has been approved by the U.S. Food and Drug Administration. Revised: March 2016