

## HIGHLIGHTS OF PRESCRIBING INFORMATION

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

### JAKAFI® (ruxolitinib) tablets, for oral use

Initial U.S. Approval: 2011

#### RECENT MAJOR CHANGES

Indications and Usage (1.2)	12/2014
Dosage and Administration (2.2), (2.3), (2.4)	12/2014
Warnings and Precautions (5.2), (5.3), (5.4)	12/2014

#### INDICATIONS AND USAGE

Jakafi is a kinase inhibitor indicated for treatment of patients with:

- intermediate or high-risk myelofibrosis, including primary myelofibrosis, post-polycythemia vera myelofibrosis and post-essential thrombocythemia myelofibrosis. (1.1)
- polycythemia vera who have had an inadequate response to or are intolerant of hydroxyurea. (1.2)

#### DOSAGE AND ADMINISTRATION

Doses should be individualized based on safety and efficacy. Starting doses per indication are noted below.

##### Myelofibrosis (2.1)

- The starting dose of Jakafi is based on patient's baseline platelet count:
  - Greater than  $200 \times 10^9/L$ : 20 mg given orally twice daily
  - $100 \times 10^9/L$  to  $200 \times 10^9/L$ : 15 mg given orally twice daily
  - $50 \times 10^9/L$  to less than  $100 \times 10^9/L$ : 5 mg given orally twice daily
- Monitor complete blood counts every 2 to 4 weeks until doses are stabilized, and then as clinically indicated. Modify or interrupt dosing for thrombocytopenia.

##### Polycythemia Vera (2.2)

- The starting dose of Jakafi is 10 mg given orally twice daily.

#### DOSAGE FORMS AND STRENGTHS

Tablets: 5 mg, 10 mg, 15 mg, 20 mg and 25 mg. (3)

#### CONTRAINDICATIONS

None. (4)

#### WARNINGS AND PRECAUTIONS

- Thrombocytopenia, Anemia and Neutropenia: Manage by dose reduction, or interruption, or transfusion. (5.1)
- Risk of Infection: Assess patients for signs and symptoms of infection and initiate appropriate treatment promptly. Serious infections should have resolved before starting therapy with Jakafi. (5.2)
- Symptom Exacerbation Following Interruption or Discontinuation: Manage with supportive care and consider resuming treatment with Jakafi. (5.3)
- Risk of Non-Melanoma Skin Cancer (5.4)

#### ADVERSE REACTIONS

The most common hematologic adverse reactions (incidence > 20%) are thrombocytopenia and anemia. The most common non-hematologic adverse reactions (incidence >10%) are bruising, dizziness and headache. (6.1)

To report SUSPECTED ADVERSE REACTIONS, contact Incyte Corporation at 1-855-463-3463 or FDA at 1-800-FDA-1088 or [www.fda.gov/medwatch](http://www.fda.gov/medwatch).

#### DRUG INTERACTIONS

- Strong CYP3A4 Inhibitors or Fluconazole: Reduce, interrupt, or discontinue Jakafi doses as recommended. (2.3) (7.1) Avoid use of Jakafi with fluconazole doses greater than 200 mg.

#### USE IN SPECIFIC POPULATIONS

- Renal Impairment: Reduce Jakafi starting dose or avoid treatment as recommended. (2.4) (8.6)
- Hepatic Impairment: Reduce Jakafi starting dose or avoid treatment as recommended. (2.4) (8.7)
- Nursing Mothers: Discontinue nursing or discontinue the drug taking into account the importance of the drug to the mother. (8.3)

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

Revised: 12/2014

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## FULL PRESCRIBING INFORMATION

### 1. INDICATIONS AND USAGE

#### 1.1 Myelofibrosis

Jakafi is indicated for treatment of patients with intermediate or high-risk myelofibrosis, including primary myelofibrosis, post-polycythemia vera myelofibrosis and post-essential thrombocythemia myelofibrosis.

#### 1.2 Polycythemia Vera

Jakafi is indicated for treatment of patients with polycythemia vera who have had an inadequate response to or are intolerant of hydroxyurea.

### 2. DOSAGE AND ADMINISTRATION

#### 2.1 Myelofibrosis

The recommended starting dose of Jakafi is based on platelet count ([Table 1](#)). A complete blood count (CBC) and platelet count must be performed before initiating therapy, every 2 to 4 weeks until doses are stabilized, and then as clinically indicated [*see Warnings and Precautions (5.1)*]. Doses may be titrated based on safety and efficacy.

**Table 1: Jakafi Starting Doses for Myelofibrosis**

Platelet Count	Starting Dose
Greater than $200 \times 10^9/L$	20 mg orally twice daily
$100 \times 10^9/L$ to $200 \times 10^9/L$	15 mg orally twice daily
$50 \times 10^9/L$ to less than $100 \times 10^9/L$	5 mg orally twice daily

#### 2.1.1 Dose Modification Guidelines for Hematologic Toxicity for Patients with Myelofibrosis Starting Treatment with a Platelet Count of $100 \times 10^9/L$ or Greater

##### Treatment Interruption and Restarting Dosing

Interrupt treatment for platelet counts less than  $50 \times 10^9/L$  or absolute neutrophil count (ANC) less than  $0.5 \times 10^9/L$ .

After recovery of platelet counts above  $50 \times 10^9/L$  and ANC above  $0.75 \times 10^9/L$ , dosing may be restarted. [Table 2](#) illustrates the maximum allowable dose that may be used in restarting Jakafi after a previous interruption.

**Table 2: Myelofibrosis: Maximum Restarting Doses for Jakafi after Safety Interruption for Thrombocytopenia for Patients Starting Treatment with a Platelet Count of  $100 \times 10^9/L$  or Greater**

<b>Current Platelet Count</b>	<b>Maximum Dose When Restarting Jakafi Treatment*</b>
Greater than or equal to $125 \times 10^9/L$	20 mg twice daily
100 to less than $125 \times 10^9/L$	15 mg twice daily
75 to less than $100 \times 10^9/L$	10 mg twice daily for at least 2 weeks; if stable, may increase to 15 mg twice daily
50 to less than $75 \times 10^9/L$	5 mg twice daily for at least 2 weeks; if stable, may increase to 10 mg twice daily
Less than $50 \times 10^9/L$	Continue hold

\*Maximum doses are displayed. When restarting, begin with a dose at least 5 mg twice daily below the dose at interruption.

Following treatment interruption for ANC below  $0.5 \times 10^9/L$ , after ANC recovers to  $0.75 \times 10^9/L$  or greater, restart dosing at the higher of 5 mg once daily or 5 mg twice daily below the largest dose in the week prior to the treatment interruption.

### **Dose Reductions**

Dose reductions should be considered if the platelet counts decrease as outlined in [Table 3](#) with the goal of avoiding dose interruptions for thrombocytopenia.

**Table 3: Myelofibrosis: Dosing Recommendations for Thrombocytopenia for Patients Starting Treatment with a Platelet Count of  $100 \times 10^9/L$  or Greater**

<b>Platelet Count</b>	<b>Dose at Time of Platelet Decline</b>				
	<b>25 mg twice daily</b>	<b>20 mg twice daily</b>	<b>15 mg twice daily</b>	<b>10 mg twice daily</b>	<b>5 mg twice daily</b>
	<b>New Dose</b>	<b>New Dose</b>	<b>New Dose</b>	<b>New Dose</b>	<b>New Dose</b>
100 to less than $125 \times 10^9/L$	20 mg twice daily	15 mg twice daily	No Change	No Change	No Change
75 to less than $100 \times 10^9/L$	10 mg twice daily	10 mg twice daily	10 mg twice daily	No Change	No Change
50 to less than $75 \times 10^9/L$	5 mg twice daily	5 mg twice daily	5 mg twice daily	5 mg twice daily	No Change
Less than $50 \times 10^9/L$	Hold	Hold	Hold	Hold	Hold

### **2.1.2 Dose Modification Based on Insufficient Response for Patients with Myelofibrosis Starting Treatment with a Platelet Count of $100 \times 10^9/L$ or Greater**

If the response is insufficient and platelet and neutrophil counts are adequate, doses may be increased in 5 mg twice daily increments to a maximum of 25 mg twice daily. Doses should not be increased during the first 4 weeks of therapy and not more frequently than every 2 weeks.

Consider dose increases in patients who meet all of the following conditions:

- a. Failure to achieve a reduction from pretreatment baseline in either palpable spleen length of 50% or a 35% reduction in spleen volume as measured by computed tomography (CT) or magnetic resonance imaging (MRI);
- b. Platelet count greater than  $125 \times 10^9/L$  at 4 weeks and platelet count never below  $100 \times 10^9/L$ ;
- c. ANC Levels greater than  $0.75 \times 10^9/L$ .

Based on limited clinical data, long-term maintenance at a 5 mg twice daily dose has not shown responses and continued use at this dose should be limited to patients in whom the benefits outweigh the potential risks. Discontinue Jakafi if there is no spleen size reduction or symptom improvement after 6 months of therapy.

### **2.1.3 Dose Modifications for Hematologic Toxicity for Patients with Myelofibrosis Starting Treatment with Platelet Counts of $50 \times 10^9/L$ to Less Than $100 \times 10^9/L$**

This section applies only to patients with platelet counts of  $50 \times 10^9/L$  to less than  $100 \times 10^9/L$  prior to any treatment with ruxolitinib. See Section 2.1.1 for dose modifications for hematological toxicity in patients whose platelet counts were  $100 \times 10^9/L$  or more prior to starting treatment with ruxolitinib.

#### **Treatment Interruption and Restarting Dosing**

Interrupt treatment for platelet counts less than  $25 \times 10^9/L$  or ANC less than  $0.5 \times 10^9/L$ .

After recovery of platelet counts above  $35 \times 10^9/L$  and ANC above  $0.75 \times 10^9/L$ , dosing may be restarted. Restart dosing at the higher of 5 mg once daily or 5 mg twice daily below the largest dose in the week prior to the decrease in platelet count below  $25 \times 10^9/L$  or ANC below  $0.5 \times 10^9/L$  that led to dose interruption.

#### **Dose Reductions**

Reduce the dose of ruxolitinib for platelet counts less than  $35 \times 10^9/L$  as described in [Table 4](#).

**Table 4: Myelofibrosis: Dosing Modifications for Thrombocytopenia for Patients with Starting Platelet Count of 50 X 10<sup>9</sup>/L to Less Than 100 X 10<sup>9</sup>/L**

<b>Platelet Count</b>	<b>Dosing Recommendations</b>
Less than 25 X 10 <sup>9</sup> /L	<ul style="list-style-type: none"> <li>• Interrupt dosing.</li> </ul>
25 X 10 <sup>9</sup> /L to less than 35 X 10 <sup>9</sup> /L AND the platelet count decline is less than 20% during the prior four weeks	<ul style="list-style-type: none"> <li>• Decrease dose by 5 mg once daily.</li> <li>• For patients on 5 mg once daily, maintain dose at 5 mg once daily.</li> </ul>
25 X 10 <sup>9</sup> /L to less than 35 X 10 <sup>9</sup> /L AND the platelet count decline is 20% or greater during the prior four weeks	<ul style="list-style-type: none"> <li>• Decrease dose by 5 mg twice daily.</li> <li>• For patients on 5 mg twice daily, decrease the dose to 5 mg once daily.</li> <li>• For patients on 5 mg once daily, maintain dose at 5 mg once daily.</li> </ul>

**2.1.4 Dose Modifications Based on Insufficient Response for Patients with Myelofibrosis and Starting Platelet Count of 50 X 10<sup>9</sup>/L to Less Than 100 X 10<sup>9</sup>/L**

Do not increase doses during the first 4 weeks of therapy, and do not increase the dose more frequently than every 2 weeks.

If the response is insufficient as defined in Section 2.1.2, doses may be increased by increments of 5 mg daily to a maximum of 10 mg twice daily if:

- a) the platelet count has remained at least 40 X 10<sup>9</sup>/L, and
- b) the platelet count has not fallen by more than 20% in the prior 4 weeks, and
- c) the ANC is more than 1 X 10<sup>9</sup>/L, and
- d) the dose has not been reduced or interrupted for an adverse event or hematological toxicity in the prior 4 weeks.

Continuation of treatment for more than 6 months should be limited to patients in whom the benefits outweigh the potential risks. Discontinue Jakafi if there is no spleen size reduction or symptom improvement after 6 months of therapy.

**2.1.5 Dose Modification for Bleeding**

Interrupt treatment for bleeding requiring intervention regardless of current platelet count. Once the bleeding event has resolved, consider resuming treatment at the prior dose if the underlying cause of bleeding has been controlled. If the bleeding event has resolved but the underlying cause persists, consider resuming treatment with Jakafi at a lower dose.

## 2.2 Polycythemia Vera

The recommended starting dose of Jakafi is 10 mg twice daily. Doses may be titrated based on safety and efficacy.

### 2.2.1 Dose Modification Guidelines for Patients with Polycythemia Vera

A complete blood count (CBC) and platelet count must be performed before initiating therapy, every 2 to 4 weeks until doses are stabilized, and then as clinically indicated [*see Warnings and Precautions (5.1)*].

#### Dose Reductions

Dose reductions should be considered for hemoglobin and platelet count decreases as described in [Table 5](#).

**Table 5: Polycythemia Vera: Dose Reductions**

Hemoglobin and/or Platelet Count	Dosing Recommendations
Hemoglobin greater than or equal to 12 g/dL AND platelet count greater than or equal to $100 \times 10^9/L$	<ul style="list-style-type: none"><li>No change required.</li></ul>
Hemoglobin 10 to less than 12 g/dL AND platelet count 75 to less than $100 \times 10^9/L$	<ul style="list-style-type: none"><li>Dose reductions should be considered with the goal of avoiding dose interruptions for anemia and thrombocytopenia.</li></ul>
Hemoglobin 8 to less than 10 g/dL OR platelet count 50 to less than $75 \times 10^9/L$	<ul style="list-style-type: none"><li>Reduce dose by 5 mg twice daily.</li><li>For patients on 5 mg twice daily, decrease the dose to 5 mg once daily.</li></ul>
Hemoglobin less than 8 g/dL OR platelet count less than $50 \times 10^9/L$	<ul style="list-style-type: none"><li>Interrupt dosing.</li></ul>

#### Treatment Interruption and Restarting Dosing

Interrupt treatment for hemoglobin less than 8 g/dL, platelet counts less than  $50 \times 10^9/L$  or ANC less than  $1.0 \times 10^9/L$ .

After recovery of the hematologic parameter(s) to acceptable levels, dosing may be restarted.

[Table 6](#) illustrates the dose that may be used in restarting Jakafi after a previous interruption.

**Table 6: Polycythemia Vera: Restarting Doses for Jakafi after Safety Interruption for Hematologic Parameter(s)**

Use the **most severe category** of a patient’s hemoglobin, platelet count, or ANC abnormality to determine the corresponding maximum restarting dose.

Hemoglobin, Platelet Count, or ANC	Maximum Restarting Dose
Hemoglobin less than 8 g/dL OR platelet count less than 50 X 10 <sup>9</sup> /L OR ANC less than 1 X 10 <sup>9</sup> /L	Continue hold
Hemoglobin 8 to less than 10 g/dL OR platelet count 50 to less than 75 X 10 <sup>9</sup> /L OR ANC 1 to less than 1.5 X 10 <sup>9</sup> /L	5 mg twice daily <sup>a</sup> or no more than 5 mg twice daily less than the dose which resulted in dose interruption
Hemoglobin 10 to less than 12 g/dL OR platelet count 75 to less than 100 X 10 <sup>9</sup> /L OR ANC 1.5 to less than 2 X 10 <sup>9</sup> /L	10 mg twice daily <sup>a</sup> or no more than 5 mg twice daily less than the dose which resulted in dose interruption
Hemoglobin greater than or equal to 12 g/dL OR platelet count greater than or equal to 100 X 10 <sup>9</sup> /L OR ANC greater than or equal to 2 X 10 <sup>9</sup> /L	15 mg twice daily <sup>a</sup> or no more than 5 mg twice daily less than the dose which resulted in dose interruption

<sup>a</sup> Continue treatment for at least 2 weeks; if stable, may increase dose by 5 mg twice daily.

Patients who had required dose interruption while receiving a dose of 5 mg twice daily, may restart at a dose of 5 mg twice daily or 5 mg once daily, but not higher, once hemoglobin is greater than or equal to 10 g/dL, platelet count is greater than or equal to 75 X 10<sup>9</sup>/L, and ANC is greater than or equal to 1.5 X 10<sup>9</sup>/L.

### **Dose Management After Restarting Treatment**

After restarting Jakafi following treatment interruption, doses may be titrated, but the maximum total daily dose should not exceed 5 mg less than the dose that resulted in the dose interruption. An exception to this is dose interruption following phlebotomy-associated anemia, in which case the maximal total daily dose allowed after restarting Jakafi would not be limited.

### **2.2.2 Dose Modifications Based on Insufficient Response for Patients with Polycythemia Vera**

If the response is insufficient and platelet, hemoglobin, and neutrophil counts are adequate, doses may be increased in 5 mg twice daily increments to a maximum of 25 mg twice daily. Doses should not be increased during the first 4 weeks of therapy and not more frequently than every two weeks.

Consider dose increases in patients who meet all of the following conditions:

1. Inadequate efficacy as demonstrated by one or more of the following:
  - a. Continued need for phlebotomy
  - b. WBC greater than the upper limit of normal range
  - c. Platelet count greater than the upper limit of normal range
  - d. Palpable spleen that is reduced by less than 25% from Baseline
2. Platelet count greater than or equal to  $140 \times 10^9/L$
3. Hemoglobin greater than or equal to 12 g/dL
4. ANC greater than or equal to  $1.5 \times 10^9/L$

## 2.3 Dose Modification for Drug Interactions

### Concomitant Use with Strong CYP3A4 Inhibitors or Fluconazole

Modify the dose of Jakafi when given concomitantly with strong CYP3A4 inhibitors (such as but not limited to boceprevir, clarithromycin, conivaptan, grapefruit juice, indinavir, itraconazole, ketoconazole, lopinavir/ritonavir, mibefradil, nefazodone, nelfinavir, posaconazole, ritonavir, saquinavir, telaprevir, telithromycin, voriconazole) and fluconazole doses of less than or equal to 200 mg as follows [*see Drug Interactions (7.1)*], according to [Table 7](#).

**Table 7: Dose Modification for Drug Interactions**

Patients on concomitant strong CYP3A4 inhibitors or fluconazole doses of less than or equal to 200 mg	Recommended Dose Modification
<b>Starting Dose for Myelofibrosis Patients with a platelet count:</b>	
<ul style="list-style-type: none"> <li>• Greater than or equal to <math>100 \times 10^9/L</math></li> </ul>	10 mg twice daily
<ul style="list-style-type: none"> <li>• <math>50 \times 10^9/L</math> to less than <math>100 \times 10^9/L</math></li> </ul>	5 mg once daily
<b>Starting Dose for Polycythemia Vera Patients</b>	5 mg twice daily
<b>All Patients on a Stable Dose of:</b>	
<ul style="list-style-type: none"> <li>• Greater than or equal to 10 mg twice daily</li> </ul>	Decrease dose by 50% (round up to the closest available tablet strength)
<ul style="list-style-type: none"> <li>• 5 mg twice daily</li> </ul>	5 mg once daily
<ul style="list-style-type: none"> <li>• 5 mg once daily</li> </ul>	Avoid strong CYP3A4 inhibitor or fluconazole treatment or interrupt Jakafi treatment for the duration of strong CYP3A4 inhibitor or fluconazole use

Avoid the use of fluconazole doses of greater than 200 mg daily concomitantly with Jakafi.

Additional dose modifications should be made with careful monitoring of safety and efficacy.



## 2.4 Organ Impairment

### Renal Impairment

Modify the dose of Jakafi accordingly in patients with moderate or severe renal impairment.

**Table 8: Dosing for Renal Impairment**

Renal Impairment Status	Platelet Count	Recommended Starting Dosage
<b>Myelofibrosis Patients</b> Moderate (CrCl 30–59 mL/min) or Severe (CrCl 15–29 mL/min)	Greater than 150 X 10 <sup>9</sup> /L	No dose modification needed
	100 X 10 <sup>9</sup> /L - 150 X 10 <sup>9</sup> /L	10 mg twice daily
	50 - less than 100 X 10 <sup>9</sup> /L	5 mg daily
	Less than 50 X 10 <sup>9</sup> /L	Avoid use [ <i>see Use in Specific Populations (8.6)</i> ]
<b>Polycythemia Vera Patients</b> Moderate (CrCl 30-59 mL/min) or Severe (CrCl 15-29 mL/min)	Any	5 mg twice daily

### Patients on Dialysis

The recommended starting dose for myelofibrosis patients with end stage renal disease on dialysis is 15 mg once after a dialysis session for patients with a platelet count between 100 X 10<sup>9</sup>/L and 200 X 10<sup>9</sup>/L or 20 mg for patients with a platelet count of greater than 200 X 10<sup>9</sup>/L. The recommended starting dose for polycythemia vera patients with end stage renal disease on dialysis is 10 mg. Additional dose modifications should be made with frequent monitoring of safety and efficacy. Avoid use of Jakafi in patients with end stage renal disease (CrCl less than 15 mL/min) not requiring dialysis [*see Use in Specific Populations (8.6)*].

### Hepatic Impairment

The dose of Jakafi should be reduced in patients with hepatic impairment.

**Table 9: Dosing for Hepatic Impairment**

Hepatic Impairment Status	Platelet Count	Recommended Starting Dosage
<b>Myelofibrosis Patients</b> Mild, Moderate, or Severe (Child-Pugh categories A, B, C)	Greater than 150 X 10 <sup>9</sup> /L	No dose modification needed
	100 X 10 <sup>9</sup> /L - 150 X 10 <sup>9</sup> /L	10 mg twice daily
	50 - less than 100 X 10 <sup>9</sup> /L	5 mg daily
	Less than 50 X 10 <sup>9</sup> /L	Avoid use [ <i>see Use in Specific Populations (8.6)</i> ]
<b>Polycythemia Vera Patients</b> Mild, Moderate, or Severe (Child-Pugh categories A, B, C)	Any	5 mg twice daily

## **2.5 Method of Administration**

Jakafi is dosed orally and can be administered with or without food.

If a dose is missed, the patient should not take an additional dose, but should take the next usual prescribed dose.

When discontinuing Jakafi therapy for reasons other than thrombocytopenia, gradual tapering of the dose of Jakafi may be considered, for example by 5 mg twice daily each week.

For patients unable to ingest tablets, Jakafi can be administered through a nasogastric tube (8 French or greater) as follows:

- Suspend one tablet in approximately 40 mL of water with stirring for approximately 10 minutes.
- Within 6 hours after the tablet has dispersed, the suspension can be administered through a nasogastric tube using an appropriate syringe.

The tube should be rinsed with approximately 75 mL of water. The effect of tube feeding preparations on Jakafi exposure during administration through a nasogastric tube has not been evaluated.

## **3. DOSAGE FORMS AND STRENGTHS**

5 mg tablets - round and white with “INCY” on one side and “5” on the other.

10 mg tablets - round and white with “INCY” on one side and “10” on the other.

15 mg tablets - oval and white with “INCY” on one side and “15” on the other.

20 mg tablets - capsule-shaped and white with “INCY” on one side and “20” on the other.

25 mg tablets - oval and white with “INCY” on one side and “25” on the other.

## **4. CONTRAINDICATIONS**

None.

## **5. WARNINGS AND PRECAUTIONS**

### **5.1 Thrombocytopenia, Anemia and Neutropenia**

Treatment with Jakafi can cause thrombocytopenia, anemia and neutropenia. [*see Dosage and Administration (2.1)*].

Manage thrombocytopenia by reducing the dose or temporarily interrupting Jakafi. Platelet transfusions may be necessary [*see Dosage and Administration (2.1.1)*, and *Adverse Reactions (6.1)*].

Patients developing anemia may require blood transfusions and/or dose modifications of Jakafi.

Severe neutropenia (ANC less than  $0.5 \times 10^9/L$ ) was generally reversible by withholding Jakafi until recovery [*see Adverse Reactions (6.1)*].

Perform a pre-treatment complete blood count (CBC) and monitor CBCs every 2 to 4 weeks until doses are stabilized, and then as clinically indicated. [*see Dosage and Administration (2.1.1)*, and *Adverse Reactions (6.1)*].

## **5.2 Risk of Infection**

Serious bacterial, mycobacterial, fungal and viral infections have occurred. Delay starting therapy with Jakafi until active serious infections have resolved. Observe patients receiving Jakafi for signs and symptoms of infection and manage promptly.

### *Tuberculosis*

Tuberculosis infection has been reported in patients receiving Jakafi. Observe patients receiving Jakafi for signs and symptoms of active tuberculosis and manage promptly.

Prior to initiating Jakafi, patients should be evaluated for tuberculosis risk factors, and those at higher risk should be tested for latent infection. Risk factors include, but are not limited to, prior residence in or travel to countries with a high prevalence of tuberculosis, close contact with a person with active tuberculosis, and a history of active or latent tuberculosis where an adequate course of treatment cannot be confirmed.

For patients with evidence of active or latent tuberculosis, consult a physician with expertise in the treatment of tuberculosis before starting Jakafi. The decision to continue Jakafi during treatment of active tuberculosis should be based on the overall risk-benefit determination.

### *PML*

Progressive multifocal leukoencephalopathy (PML) has occurred with ruxolitinib treatment for myelofibrosis. If PML is suspected, stop Jakafi and evaluate.

### *Herpes Zoster*

Advise patients about early signs and symptoms of herpes zoster and to seek treatment as early as possible if suspected [*see Adverse Reactions (6.1)*].

## **5.3 Symptom Exacerbation Following Interruption or Discontinuation of Treatment with Jakafi**

Following discontinuation of Jakafi, symptoms from myeloproliferative neoplasms may return to pretreatment levels over a period of approximately one week. Some patients with myelofibrosis have experienced one or more of the following adverse events after discontinuing Jakafi: fever, respiratory distress, hypotension, DIC, or multi-organ failure. If one or more of these occur after discontinuation of, or while tapering the dose of Jakafi, evaluate for and treat any intercurrent illness and consider restarting or increasing the dose of Jakafi. Instruct patients not to interrupt or discontinue Jakafi therapy without consulting their physician. When discontinuing or interrupting therapy with Jakafi for reasons other than thrombocytopenia or neutropenia [*see Dosage and Administration (2.5)*], consider tapering the dose of Jakafi gradually rather than discontinuing abruptly.

## 5.4 Non-Melanoma Skin Cancer

Non-melanoma skin cancers including basal cell, squamous cell, and Merkel cell carcinoma have occurred in patients treated with Jakafi. Perform periodic skin examinations.

## 6. ADVERSE REACTIONS

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

- Thrombocytopenia, Anemia and Neutropenia [*see Warnings and Precautions (5.1)*]
- Risk of Infection [*see Warnings and Precautions (5.2)*]
- Symptom Exacerbation Following Interruption or Discontinuation of Treatment with Jakafi [*see Warnings and Precautions (5.3)*]
- Non-Melanoma Skin Cancer [*see Warnings and Precautions (5.4)*]

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 practice.

### 6.1 Clinical Trials Experience in Myelofibrosis

The safety of Jakafi was assessed in 617 patients in six clinical studies with a median duration of follow-up of 10.9 months, including 301 patients with myelofibrosis in two Phase 3 studies.

In these two Phase 3 studies, patients had a median duration of exposure to Jakafi of 9.5 months (range 0.5 to 17 months), with 89% of patients treated for more than 6 months and 25% treated for more than 12 months. One hundred and eleven (111) patients started treatment at 15 mg twice daily and 190 patients started at 20 mg twice daily. In patients starting treatment with 15 mg twice daily (pretreatment platelet counts of 100 to 200 X 10<sup>9</sup>/L) and 20 mg twice daily (pretreatment platelet counts greater than 200 X 10<sup>9</sup>/L), 65% and 25% of patients, respectively, required a dose reduction below the starting dose within the first 8 weeks of therapy.

In a double-blind, randomized, placebo-controlled study of Jakafi, among the 155 patients treated with Jakafi, the most frequent adverse drug reactions were thrombocytopenia and anemia [*see Table 11*]. Thrombocytopenia, anemia and neutropenia are dose related effects. The three most frequent non-hematologic adverse reactions were bruising, dizziness and headache [*see Table 10*].

Discontinuation for adverse events, regardless of causality, was observed in 11% of patients treated with Jakafi and 11% of patients treated with placebo.

[Table 10](#) presents the most common adverse reactions occurring in patients who received Jakafi in the double-blind, placebo-controlled study during randomized treatment.

**Table 10: Myelofibrosis: Adverse Reactions Occurring in Patients on Jakafi in the Double-blind, Placebo-controlled Study During Randomized Treatment**

Adverse Reactions	Jakafi (N=155)			Placebo (N=151)		
	All Grades <sup>a</sup> (%)	Grade 3 (%)	Grade 4 (%)	All Grades (%)	Grade 3 (%)	Grade 4 (%)
Bruising <sup>b</sup>	23	<1	0	15	0	0
Dizziness <sup>c</sup>	18	<1	0	7	0	0
Headache	15	0	0	5	0	0
Urinary Tract Infections <sup>d</sup>	9	0	0	5	<1	<1
Weight Gain <sup>e</sup>	7	<1	0	1	<1	0
Flatulence	5	0	0	<1	0	0
Herpes Zoster <sup>f</sup>	2	0	0	<1	0	0

<sup>a</sup> National Cancer Institute Common Terminology Criteria for Adverse Events (CTCAE), version 3.0

<sup>b</sup> includes contusion, ecchymosis, hematoma, injection site hematoma, periorbital hematoma, vessel puncture site hematoma, increased tendency to bruise, petechiae, purpura

<sup>c</sup> includes dizziness, postural dizziness, vertigo, balance disorder, Meniere's Disease, labyrinthitis

<sup>d</sup> includes urinary tract infection, cystitis, urosepsis, urinary tract infection bacterial, kidney infection, pyuria, bacteria urine, bacteria urine identified, nitrite urine present

<sup>e</sup> includes weight increased, abnormal weight gain

<sup>f</sup> includes herpes zoster and post-herpetic neuralgia

## Description of Selected Adverse Drug Reactions

### Anemia

In the two Phase 3 clinical studies, median time to onset of first CTCAE Grade 2 or higher anemia was approximately 6 weeks. One patient (<1%) discontinued treatment because of anemia. In patients receiving Jakafi, mean decreases in hemoglobin reached a nadir of approximately 1.5 to 2.0 g/dL below baseline after 8 to 12 weeks of therapy and then gradually recovered to reach a new steady state that was approximately 1.0 g/dL below baseline. This pattern was observed in patients regardless of whether they had received transfusions during therapy.

In the randomized, placebo-controlled study, 60% of patients treated with Jakafi and 38% of patients receiving placebo received red blood cell transfusions during randomized treatment. Among transfused patients, the median number of units transfused per month was 1.2 in patients treated with Jakafi and 1.7 in placebo treated patients.

### Thrombocytopenia

In the two Phase 3 clinical studies, in patients who developed Grade 3 or 4 thrombocytopenia, the median time to onset was approximately 8 weeks. Thrombocytopenia was generally reversible with dose reduction or dose interruption. The median time to recovery of platelet counts above  $50 \times 10^9/L$  was 14 days. Platelet transfusions were administered to 5% of patients receiving Jakafi and to 4% of patients receiving control regimens. Discontinuation of treatment

because of thrombocytopenia occurred in <1% of patients receiving Jakafi and <1% of patients receiving control regimens. Patients with a platelet count of  $100 \times 10^9/L$  to  $200 \times 10^9/L$  before starting Jakafi had a higher frequency of Grade 3 or 4 thrombocytopenia compared to patients with a platelet count greater than  $200 \times 10^9/L$  (17% versus 7%).

## Neutropenia

In the two Phase 3 clinical studies, 1% of patients reduced or stopped Jakafi because of neutropenia.

Table 11 provides the frequency and severity of clinical hematology abnormalities reported for patients receiving treatment with Jakafi or placebo in the placebo-controlled study.

**Table 11: Myelofibrosis: Worst Hematology Laboratory Abnormalities in the Placebo-Controlled Study<sup>a</sup>**

Laboratory Parameter	Jakafi (N=155)			Placebo (N=151)		
	All Grades <sup>b</sup> (%)	Grade 3 (%)	Grade 4 (%)	All Grades (%)	Grade 3 (%)	Grade 4 (%)
Thrombocytopenia	70	9	4	31	1	0
Anemia	96	34	11	87	16	3
Neutropenia	19	5	2	4	<1	1

<sup>a</sup> Presented values are worst Grade values regardless of baseline

<sup>b</sup> National Cancer Institute Common Terminology Criteria for Adverse Events, version 3.0

## Additional Data from the Placebo-controlled Study

25% of patients treated with Jakafi and 7% of patients treated with placebo developed newly occurring or worsening Grade 1 abnormalities in alanine transaminase (ALT). The incidence of greater than or equal to Grade 2 elevations was 2% for Jakafi with 1% Grade 3 and no Grade 4 ALT elevations.

17% of patients treated with Jakafi and 6% of patients treated with placebo developed newly occurring or worsening Grade 1 abnormalities in aspartate transaminase (AST). The incidence of Grade 2 AST elevations was <1% for Jakafi with no Grade 3 or 4 AST elevations.

17% of patients treated with Jakafi and <1% of patients treated with placebo developed newly occurring or worsening Grade 1 elevations in cholesterol. The incidence of Grade 2 cholesterol elevations was <1% for Jakafi with no Grade 3 or 4 cholesterol elevations.

## 6.2 Clinical Trial Experience in Polycythemia Vera

In a randomized, open-label, active-controlled study, 110 patients with polycythemia vera resistant to or intolerant of hydroxyurea received Jakafi and 111 patients received best available therapy [see *Clinical Studies* (14.2)]. The most frequent adverse drug reaction was anemia.

Table 12 presents the most frequent non-hematologic treatment emergent adverse events occurring up to Week 32.

Discontinuation for adverse events, regardless of causality, was observed in 4% of patients treated with Jakafi.

**Table 12: Polycythemia Vera: Treatment Emergent Adverse Events Occurring in  $\geq$  6% of Patients on Jakafi in the Open-Label, Active-controlled Study up to Week 32 of Randomized Treatment**

Adverse Events	Jakafi (N=110)		Best Available Therapy (N=111)	
	All Grades <sup>a</sup> (%)	Grade 3-4 (%)	All Grades (%)	Grade 3-4 (%)
Headache	16	<1	19	<1
Abdominal Pain <sup>b</sup>	15	<1	15	<1
Diarrhea	15	0	7	<1
Dizziness <sup>c</sup>	15	0	13	0
Fatigue	15	0	15	3
Pruritus	14	<1	23	4
Dyspnea <sup>d</sup>	13	3	4	0
Muscle Spasms	12	<1	5	0
Nasopharyngitis	9	0	8	0
Constipation	8	0	3	0
Cough	8	0	5	0
Edema <sup>e</sup>	8	0	7	0
Arthralgia	7	0	6	<1
Asthenia	7	0	11	2
Epistaxis	6	0	3	0
Herpes Zoster <sup>f</sup>	6	<1	0	0
Nausea	6	0	4	0

<sup>a</sup> National Cancer Institute Common Terminology Criteria for Adverse Events (CTCAE), version 3.0

<sup>b</sup> includes abdominal pain, abdominal pain lower, and abdominal pain upper

<sup>c</sup> includes dizziness and vertigo

<sup>d</sup> includes dyspnea and dyspnea exertional

<sup>e</sup> includes edema and peripheral edema

<sup>f</sup> includes herpes zoster and post-herpetic neuralgia

Other clinically important treatment emergent adverse events observed in less than 6% of patients treated with Jakafi were:

Weight gain, hypertension, and urinary tract infections

Clinically relevant laboratory abnormalities are shown in [Table 13](#).

**Table 13: Polycythemia Vera: Selected Laboratory Abnormalities in the Open-Label, Active-controlled Study up to Week 32 of Randomized Treatment<sup>a</sup>**

Laboratory Parameter	Jakafi (N=110)			Best Available Therapy (N=111)		
	All Grades <sup>b</sup> (%)	Grade 3 (%)	Grade 4 (%)	All Grades (%)	Grade 3 (%)	Grade 4 (%)
<b>Hematology</b>						
Anemia	72	<1	<1	58	0	0
Thrombocytopenia	27	5	<1	24	3	<1
Neutropenia	3	0	<1	10	<1	0
<b>Chemistry</b>						
Hypercholesterolemia	35	0	0	8	0	0
Elevated ALT	25	<1	0	16	0	0
Elevated AST	23	0	0	23	<1	0
Hypertriglyceridemia	15	0	0	13	0	0

<sup>a</sup> Presented values are worst Grade values regardless of baseline

<sup>b</sup> National Cancer Institute Common Terminology Criteria for Adverse Events, version 3.0

## 7. DRUG INTERACTIONS

### 7.1 Drugs That Inhibit or Induce Cytochrome P450 Enzymes

Ruxolitinib is metabolized by CYP3A4 and to a lesser extent by CYP2C9.

**CYP3A4 inhibitors:** The  $C_{max}$  and AUC of ruxolitinib increased 33% and 91%, respectively following concomitant administration with the strong CYP3A4 inhibitor ketoconazole in healthy subjects. Concomitant administration with mild or moderate CYP3A4 inhibitors did not result in an exposure change requiring intervention [*see Pharmacokinetics (12.3)*].

When administering Jakafi with strong CYP3A4 inhibitors, consider dose reduction [*see Dosage and Administration (2.3)*].

**Fluconazole:** The AUC of ruxolitinib is predicted to increase by approximately 100% to 300% following concomitant administration with the combined CYP3A4 and CYP2C9 inhibitor fluconazole at doses of 100 mg to 400 mg once daily, respectively [*see Pharmacokinetics (12.3)*].

Avoid the concomitant use of Jakafi with fluconazole doses of greater than 200 mg daily [*see Dosage and Administration (2.3)*].

**CYP3A4 inducers:** The  $C_{max}$  and AUC of ruxolitinib decreased 32% and 61%, respectively, following concomitant administration with the strong CYP3A4 inducer rifampin in healthy subjects. No dose adjustment is recommended; however, monitor patients frequently and adjust the Jakafi dose based on safety and efficacy [*see Pharmacokinetics (12.3)*].



## **8. USE IN SPECIFIC POPULATIONS**

### **8.1 Pregnancy**

#### **Pregnancy Category C**

##### *Risk Summary*

There are no adequate and well-controlled studies of Jakafi in pregnant women. In embryofetal toxicity studies, treatment with ruxolitinib resulted in an increase in late resorptions and reduced fetal weights at maternally toxic doses. Jakafi should be used during pregnancy only if the potential benefit justifies the potential risk to the fetus.

##### *Animal Data*

Ruxolitinib was administered orally to pregnant rats or rabbits during the period of organogenesis, at doses of 15, 30 or 60 mg/kg/day in rats and 10, 30 or 60 mg/kg/day in rabbits. There was no evidence of teratogenicity. However, decreases of approximately 9% in fetal weights were noted in rats at the highest and maternally toxic dose of 60 mg/kg/day. This dose results in an exposure (AUC) that is approximately 2 times the clinical exposure at the maximum recommended dose of 25 mg twice daily. In rabbits, lower fetal weights of approximately 8% and increased late resorptions were noted at the highest and maternally toxic dose of 60 mg/kg/day. This dose is approximately 7% the clinical exposure at the maximum recommended dose.

In a pre- and post-natal development study in rats, pregnant animals were dosed with ruxolitinib from implantation through lactation at doses up to 30 mg/kg/day. There were no drug-related adverse findings in pups for fertility indices or for maternal or embryofetal survival, growth and development parameters at the highest dose evaluated (34% the clinical exposure at the maximum recommended dose of 25 mg twice daily).

### **8.3 Nursing Mothers**

It is not known whether ruxolitinib is excreted in human milk. Ruxolitinib and/or its metabolites were excreted in the milk of lactating rats with a concentration that was 13-fold the maternal plasma. Because many drugs are excreted in human milk and because of the potential for serious adverse reactions in nursing infants from Jakafi, a decision should be made to discontinue nursing or to discontinue the drug, taking into account the importance of the drug to the mother.

### **8.4 Pediatric Use**

The safety and effectiveness of Jakafi in pediatric patients have not been established.

### **8.5 Geriatric Use**

Of the total number of myelofibrosis patients in clinical studies with Jakafi, 52% were 65 years of age and older. No overall differences in safety or effectiveness of Jakafi were observed between these patients and younger patients.

## 8.6 Renal Impairment

The safety and pharmacokinetics of single dose Jakafi (25 mg) were evaluated in a study in healthy subjects [CrCl 72-164 mL/min (N=8)] and in subjects with mild [CrCl 53-83 mL/min (N=8)], moderate [CrCl 38-57 mL/min (N=8)], or severe renal impairment [CrCl 15-51 mL/min (N=8)]. Eight (8) additional subjects with end stage renal disease requiring hemodialysis were also enrolled.

The pharmacokinetics of ruxolitinib was similar in subjects with various degrees of renal impairment and in those with normal renal function. However, plasma AUC values of ruxolitinib metabolites increased with increasing severity of renal impairment. This was most marked in the subjects with end stage renal disease requiring hemodialysis. The change in the pharmacodynamic marker, pSTAT3 inhibition, was consistent with the corresponding increase in metabolite exposure. Ruxolitinib is not removed by dialysis; however, the removal of some active metabolites by dialysis cannot be ruled out.

When administering Jakafi to patients with myelofibrosis and moderate (CrCl 30-59 mL/min) or severe renal impairment (CrCl 15-29 mL/min) with a platelet count between  $50 \times 10^9/L$  and  $150 \times 10^9/L$ , a dose reduction is recommended. A dose reduction is also recommended for patients with polycythemia vera and moderate (CrCl 30-59 mL/min) or severe renal impairment (CrCl 15-29 mL/min). In all patients with end stage renal disease on dialysis, a dose reduction is recommended [*see Dosage and Administration (2.4)*].

## 8.7 Hepatic Impairment

The safety and pharmacokinetics of single dose Jakafi (25 mg) were evaluated in a study in healthy subjects (N=8) and in subjects with mild [Child-Pugh A (N=8)], moderate [Child-Pugh B (N=8)], or severe hepatic impairment [Child-Pugh C (N=8)]. The mean AUC for ruxolitinib was increased by 87%, 28% and 65%, respectively, in patients with mild, moderate and severe hepatic impairment compared to patients with normal hepatic function. The terminal elimination half-life was prolonged in patients with hepatic impairment compared to healthy controls (4.1-5.0 hours versus 2.8 hours). The change in the pharmacodynamic marker, pSTAT3 inhibition, was consistent with the corresponding increase in ruxolitinib exposure except in the severe (Child-Pugh C) hepatic impairment cohort where the pharmacodynamic activity was more prolonged in some subjects than expected based on plasma concentrations of ruxolitinib.

When administering Jakafi to patients with myelofibrosis and any degree of hepatic impairment and with a platelet count between  $50 \times 10^9/L$  and  $150 \times 10^9/L$ , a dose reduction is recommended. A dose reduction is also recommended for patients with polycythemia vera and hepatic impairment [*see Dosage and Administration (2.4)*].

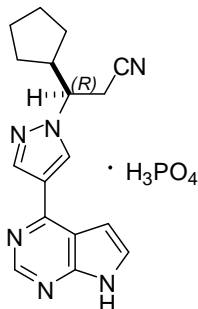
## 10. OVERDOSAGE

There is no known antidote for overdoses with Jakafi. Single doses up to 200 mg have been given with acceptable acute tolerability. Higher than recommended repeat doses are associated with increased myelosuppression including leukopenia, anemia and thrombocytopenia. Appropriate supportive treatment should be given.

Hemodialysis is not expected to enhance the elimination of ruxolitinib.

## 11. DESCRIPTION

Ruxolitinib phosphate is a kinase inhibitor with the chemical name (*R*)-3-(4-(7*H*-pyrrolo[2,3-*d*]pyrimidin-4-yl)-1*H*-pyrazol-1-yl)-3-cyclopentylpropanenitrile phosphate and a molecular weight of 404.36. Ruxolitinib phosphate has the following structural formula:



Ruxolitinib phosphate is a white to off-white to light pink powder and is soluble in aqueous buffers across a pH range of 1 to 8.

Jakafi (ruxolitinib) Tablets are for oral administration. Each tablet contains ruxolitinib phosphate equivalent to 5 mg, 10 mg, 15 mg, 20 mg and 25 mg of ruxolitinib free base together with microcrystalline cellulose, lactose monohydrate, magnesium stearate, colloidal silicon dioxide, sodium starch glycolate, povidone and hydroxypropyl cellulose.

## 12. CLINICAL PHARMACOLOGY

### 12.1 Mechanism of Action

Ruxolitinib, a kinase inhibitor, inhibits Janus Associated Kinases (JAKs) JAK1 and JAK2 which mediate the signaling of a number of cytokines and growth factors that are important for hematopoiesis and immune function. JAK signaling involves recruitment of STATs (signal transducers and activators of transcription) to cytokine receptors, activation and subsequent localization of STATs to the nucleus leading to modulation of gene expression.

Myelofibrosis (MF) and polycythemia vera (PV) are myeloproliferative neoplasms (MPN) known to be associated with dysregulated JAK1 and JAK2 signaling. In a mouse model of JAK2V617F-positive MPN, oral administration of ruxolitinib prevented splenomegaly, preferentially decreased JAK2V617F mutant cells in the spleen and decreased circulating inflammatory cytokines (eg, TNF- $\alpha$ , IL-6).

### 12.2 Pharmacodynamics

Ruxolitinib inhibits cytokine induced STAT3 phosphorylation in whole blood from healthy subjects and MF and PV patients. Jakafi administration resulted in maximal inhibition of STAT3 phosphorylation 2 hours after dosing which returned to near baseline by 10 hours in both healthy subjects and MF and PV patients.

## 12.3 Pharmacokinetics

### Absorption

In clinical studies, ruxolitinib is rapidly absorbed after oral Jakafi administration with maximal plasma concentration ( $C_{\max}$ ) achieved within 1 to 2 hours post-dose. Based on a mass balance study in humans, oral absorption of ruxolitinib was estimated to be at least 95%. Mean ruxolitinib  $C_{\max}$  and total exposure (AUC) increased proportionally over a single dose range of 5 to 200 mg. There were no clinically relevant changes in the pharmacokinetics of ruxolitinib upon administration of Jakafi with a high-fat meal, with the mean  $C_{\max}$  moderately decreased (24%) and the mean AUC nearly unchanged (4% increase).

### Distribution

The mean volume of distribution at steady-state is 72 L in MF patients with an associated inter-subject variability of 29% and 75 L in PV patients with an associated inter-subject variability of 23%. Binding to plasma proteins *in vitro* is approximately 97%, mostly to albumin.

### Metabolism

*In vitro* studies suggest that ruxolitinib is metabolized by CYP3A4 and to a lesser extent by CYP2C9.

### Elimination

Following a single oral dose of [ $^{14}\text{C}$ ]-labeled ruxolitinib in healthy adult subjects, elimination was predominately through metabolism with 74% of radioactivity excreted in urine and 22% excretion via feces. Unchanged drug accounted for less than 1% of the excreted total radioactivity. The mean elimination half-life of ruxolitinib is approximately 3 hours and the mean half-life of ruxolitinib + metabolites is approximately 5.8 hours.

### Effects of Age, Gender, or Race

In healthy subjects, no significant differences in ruxolitinib pharmacokinetics were observed with regard to gender and race. In a population pharmacokinetic evaluation in MF patients, no relationship was apparent between oral clearance and patient age or race, and in women, clearance was 17.7 L/h and in men, 22.1 L/h with 39% inter-subject variability. Clearance was 12.7 L/h in PV patients, with a 42% inter-subject variability, and no relationship was apparent between oral clearance and gender, patient age or race in this patient population.

### Drug Interactions

**Strong CYP3A4 inhibitors:** In a trial of 16 healthy volunteers, a single dose of 10 mg of Jakafi was administered alone on Day 1 and a single dose of 10 mg of Jakafi was administered on Day 5 in combination with 200 mg of ketoconazole (a strong CYP3A4 inhibitor, given twice daily on Days 2 to 5). Ketoconazole increased ruxolitinib  $C_{\max}$  and AUC by 33% and 91%, respectively. Ketoconazole also prolonged ruxolitinib half-life from 3.7 to 6.0 hours [*see Dosage and Administration (2.3) and Drug Interactions (7.1)*].

**Fluconazole:** Simulations using physiologically-based pharmacokinetic (PBPK) models suggested that fluconazole (a dual CYP3A4 and CYP2C9 inhibitor) increases steady state

ruxolitinib AUC by approximately 100% to 300% following concomitant administration of 10 mg of Jakafi twice daily with 100 mg to 400 mg of fluconazole once daily, respectively [see *Dosage and Administration (2.3) and Drug Interactions (7.1)*].

**Mild or moderate CYP3A4 inhibitors:** In a trial of 15 healthy volunteers, a single dose of 10 mg of Jakafi was administered alone on Day 1 and a single dose of 10 mg of Jakafi was administered on Day 5 in combination with 500 mg of erythromycin (a moderate CYP3A4 inhibitor, given twice daily on Days 2 to 5). Erythromycin increased ruxolitinib C<sub>max</sub> and AUC by 8% and 27%, respectively [see *Drug Interactions (7.1)*].

**CYP3A4 inducers:** In a trial of 12 healthy volunteers, a single dose of 50 mg of Jakafi was administered alone on Day 1 and a single dose of 50 mg of Jakafi was administered on Day 13 in combination with 600 mg of rifampin (a strong CYP3A4 inducer, given once daily on Days 3 to 13). Rifampin decreased ruxolitinib C<sub>max</sub> and AUC by 32% and 61%, respectively. In addition, the relative exposure to ruxolitinib's active metabolites increased approximately 100% [see *Drug Interactions (7.1)*].

**In vitro studies:** *In vitro*, ruxolitinib and its M18 metabolite do not inhibit CYP1A2, CYP2B6, CYP2C8, CYP2C9, CYP2C19, CYP2D6 or CYP3A4. Ruxolitinib is not an inducer of CYP1A2, CYP2B6 or CYP3A4 at clinically relevant concentrations.

*In vitro*, ruxolitinib and its M18 metabolite do not inhibit the P-gp, BCRP, OATP1B1, OATP1B3, OCT1, OCT2, OAT1 or OAT3 transport systems at clinically relevant concentrations. Ruxolitinib is not a substrate for the P-gp transporter.

## 12.4 Thorough QT Study

The effect of single dose ruxolitinib 25 mg and 200 mg on QTc interval was evaluated in a randomized, placebo-, and active-controlled (moxifloxacin 400 mg) four-period crossover thorough QT study in 47 healthy subjects. In a study with demonstrated ability to detect small effects, the upper bound of the one-sided 95% confidence interval for the largest placebo adjusted, baseline-corrected QTc based on Fridericia correction method (QTcF) was below 10 ms, the threshold for regulatory concern. The dose of 200 mg is adequate to represent the high exposure clinical scenario.

## 13. NONCLINICAL TOXICOLOGY

### 13.1 Carcinogenesis, Mutagenesis, Impairment of Fertility

Ruxolitinib was not carcinogenic in the 6-month Tg.rasH2 transgenic mouse model or in a 2-year carcinogenicity study in the rat.

Ruxolitinib was not mutagenic in a bacterial mutagenicity assay (Ames test) or clastogenic in *in vitro* chromosomal aberration assay (cultured human peripheral blood lymphocytes) or *in vivo* in a rat bone marrow micronucleus assay.

In a fertility study, ruxolitinib was administered to male rats prior to and throughout mating and to female rats prior to mating and up to the implantation day (gestation day 7). Ruxolitinib had no effect on fertility or reproductive function in male or female rats at doses of 10, 30 or 60 mg/kg/day. However, in female rats doses of greater than or equal to 30 mg/kg/day resulted in

increased post-implantation loss. The exposure (AUC) at the dose of 30 mg/kg/day is approximately 34% the clinical exposure at the maximum recommended dose of 25 mg twice daily.

## **14. CLINICAL STUDIES**

### **14.1 Myelofibrosis**

Two randomized Phase 3 studies (Studies 1 and 2) were conducted in patients with myelofibrosis (either primary myelofibrosis, post-polycythemia vera myelofibrosis or post-essential thrombocythemia-myelofibrosis). In both studies, patients had palpable splenomegaly at least 5 cm below the costal margin and risk category of intermediate 2 (2 prognostic factors) or high risk (3 or more prognostic factors) based on the International Working Group Consensus Criteria (IWG).

The starting dose of Jakafi was based on platelet count. Patients with a platelet count between 100 and  $200 \times 10^9/L$  were started on Jakafi 15 mg twice daily and patients with a platelet count greater than  $200 \times 10^9/L$  were started on Jakafi 20 mg twice daily. Doses were then individualized based upon tolerability and efficacy with maximum doses of 20 mg twice daily for patients with platelet counts between 100 to less than or equal to  $125 \times 10^9/L$ , of 10 mg twice daily for patients with platelet counts between 75 to less than or equal to  $100 \times 10^9/L$ , and of 5 mg twice daily for patients with platelet counts between 50 to less than or equal to  $75 \times 10^9/L$ .

#### Study 1

Study 1 was a double-blind, randomized, placebo-controlled study in 309 patients who were refractory to or were not candidates for available therapy. The median age was 68 years (range 40 to 91 years) with 61% of patients older than 65 years and 54% were male. Fifty percent (50%) of patients had primary myelofibrosis, 31% had post-polycythemia vera myelofibrosis and 18% had post-essential thrombocythemia myelofibrosis. Twenty-one percent (21%) of patients had red blood cell transfusions within 8 weeks of enrollment in the study. The median hemoglobin count was 10.5 g/dL and the median platelet count was  $251 \times 10^9/L$ . Patients had a median palpable spleen length of 16 cm below the costal margin, with 81% having a spleen length 10 cm or greater below the costal margin. Patients had a median spleen volume as measured by magnetic resonance imaging (MRI) or computed tomography (CT) of  $2595 \text{ cm}^3$  (range  $478 \text{ cm}^3$  to  $8881 \text{ cm}^3$ ). (The upper limit of normal is approximately  $300 \text{ cm}^3$ ).

Patients were dosed with Jakafi or matching placebo. The primary efficacy endpoint was the proportion of patients achieving greater than or equal to a 35% reduction from baseline in spleen volume at Week 24 as measured by MRI or CT.

Secondary endpoints included duration of a 35% or greater reduction in spleen volume and proportion of patients with a 50% or greater reduction in Total Symptom Score from baseline to Week 24 as measured by the modified Myelofibrosis Symptom Assessment Form (MFSAF) v2.0 diary.

## Study 2

Study 2 was an open-label, randomized study in 219 patients. Patients were randomized 2:1 to Jakafi versus best available therapy. Best available therapy was selected by the investigator on a patient-by-patient basis. In the best available therapy arm, the medications received by more than 10% of patients were hydroxyurea (47%) and glucocorticoids (16%). The median age was 66 years (range 35 to 85 years) with 52% of patients older than 65 years and 57% were male. Fifty-three percent (53%) of patients had primary myelofibrosis, 31% had post-polycythemia vera myelofibrosis and 16% had post-essential thrombocythemia myelofibrosis. Twenty-one percent (21%) of patients had red blood cell transfusions within 8 weeks of enrollment in the study. The median hemoglobin count was 10.4 g/dL and the median platelet count was  $236 \times 10^9/L$ . Patients had a median palpable spleen length of 15 cm below the costal margin, with 70% having a spleen length 10 cm or greater below the costal margin. Patients had a median spleen volume as measured by MRI or CT of  $2381 \text{ cm}^3$  (range  $451 \text{ cm}^3$  to  $7765 \text{ cm}^3$ ).

The primary efficacy endpoint was the proportion of patients achieving 35% or greater reduction from baseline in spleen volume at Week 48 as measured by MRI or CT.

A secondary endpoint in Study 2 was the proportion of patients achieving a 35% or greater reduction of spleen volume as measured by MRI or CT from baseline to Week 24.

## Study 1 and 2 Efficacy Results

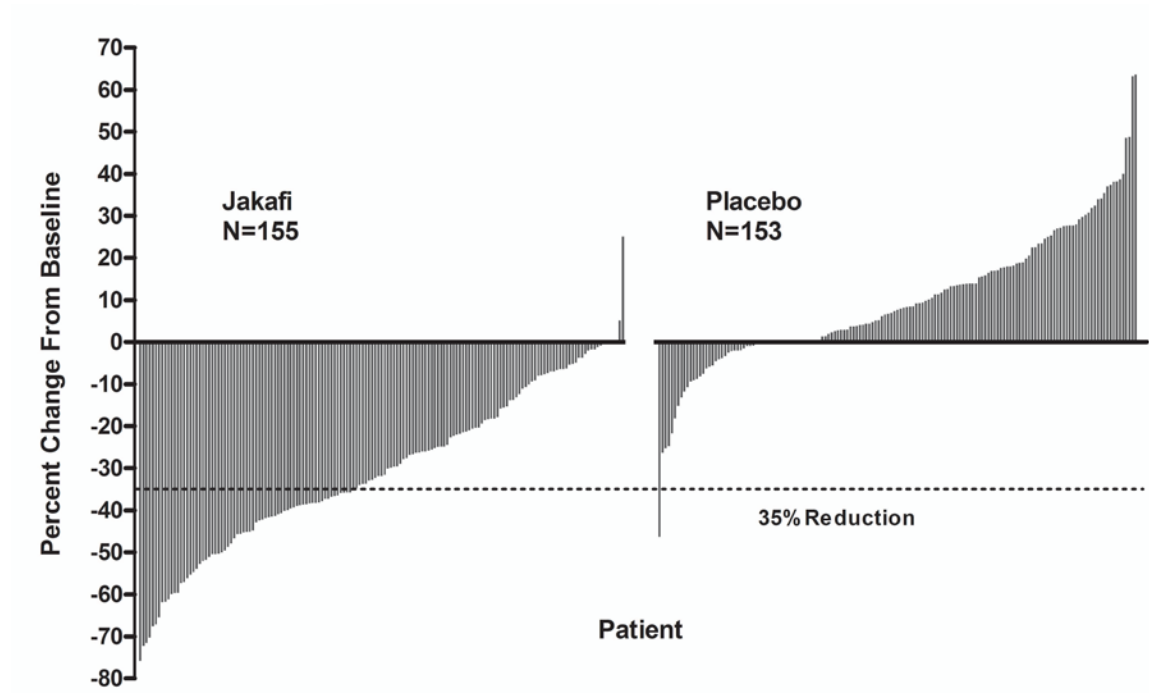
Efficacy analyses of the primary endpoint in Studies 1 and 2 are presented in [Table 14](#) below. A significantly larger proportion of patients in the Jakafi group achieved a 35% or greater reduction in spleen volume from baseline in both studies compared to placebo in Study 1 and best available therapy in Study 2. A similar proportion of patients in the Jakafi group achieved a 50% or greater reduction in palpable spleen length.

**Table 14: Percent of Patients with Myelofibrosis Achieving 35% or Greater Reduction from Baseline in Spleen Volume at Week 24 in Study 1 and at Week 48 in Study 2 (Intent to Treat)**

	Study 1		Study 2	
	Jakafi (N=155)	Placebo (N=154)	Jakafi (N=146)	Best Available Therapy (N=73)
Time Points	Week 24		Week 48	
Number (%) of Patients with Spleen Volume Reduction by 35% or More	65 (42)	1 (<1)	41 (29)	0
P-value	< 0.0001		< 0.0001	

[Figure 1](#) shows the percent change from baseline in spleen volume for each patient at Week 24 (Jakafi N=139, placebo N=106) or the last evaluation prior to Week 24 for patients who did not complete 24 weeks of randomized treatment (Jakafi N=16, placebo N=47). One (1) patient (placebo) with a missing baseline spleen volume is not included.

**Figure 1: Percent Change from Baseline in Spleen Volume at Week 24 or Last Observation for Each Patient (Study 1)**



In Study 1, myelofibrosis symptoms were a secondary endpoint and were measured using the modified Myelofibrosis Symptom Assessment Form (MFSAF) v2.0 diary. The modified MFSAF is a daily diary capturing the core symptoms of myelofibrosis (abdominal discomfort, pain under left ribs, night sweats, itching, bone/muscle pain and early satiety). Symptom scores ranged from 0 to 10 with 0 representing symptoms “absent” and 10 representing “worst imaginable” symptoms. These scores were added to create the daily total score, which has a maximum of 60.

Table 15 presents assessments of Total Symptom Score from baseline to Week 24 in Study 1 including the proportion of patients with at least a 50% reduction (ie, improvement in symptoms). At baseline, the mean Total Symptom Score was 18.0 in the Jakafi group and 16.5 in the placebo group. A higher proportion of patients in the Jakafi group had a 50% or greater reduction in Total Symptom Score than in the placebo group, with a median time to response of less than 4 weeks.

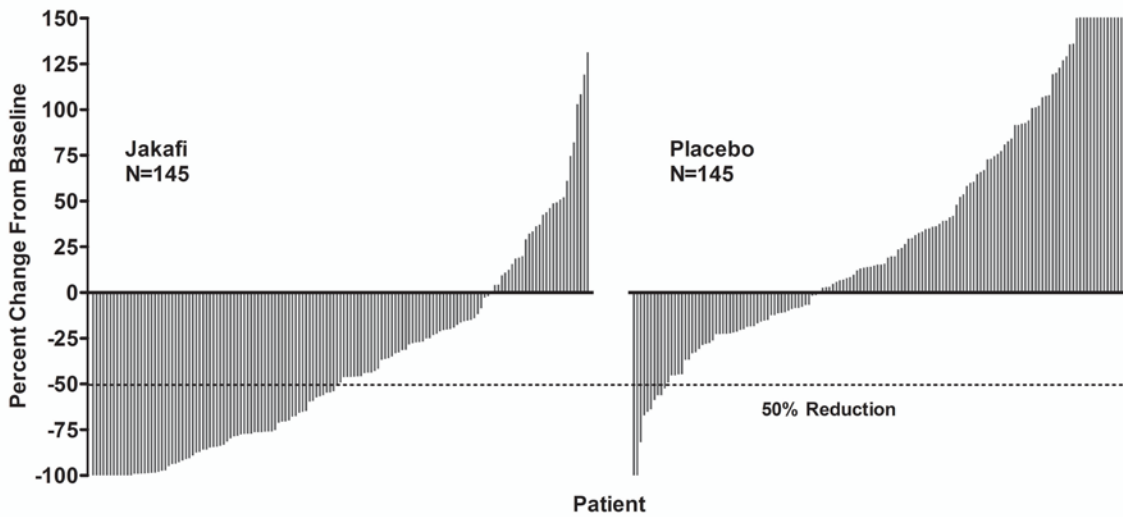
**Table 15: Improvement in Total Symptom Score in Patients with Myelofibrosis**

	<b>Jakafi (N=148)</b>	<b>Placebo (N=152)</b>
Number (%) of Patients with 50% or Greater Reduction in Total Symptom Score by Week 24	68 (46)	8 (5)
P-value	< 0.0001	



Figure 2 shows the percent change from baseline in Total Symptom Score for each patient at Week 24 (Jakafi N=129, placebo N=103) or the last evaluation on randomized therapy prior to Week 24 for patients who did not complete 24 weeks of randomized treatment (Jakafi N=16, placebo N=42). Results are excluded for 5 patients with a baseline Total Symptom Score of zero, 8 patients with missing baseline and 6 patients with insufficient post-baseline data.

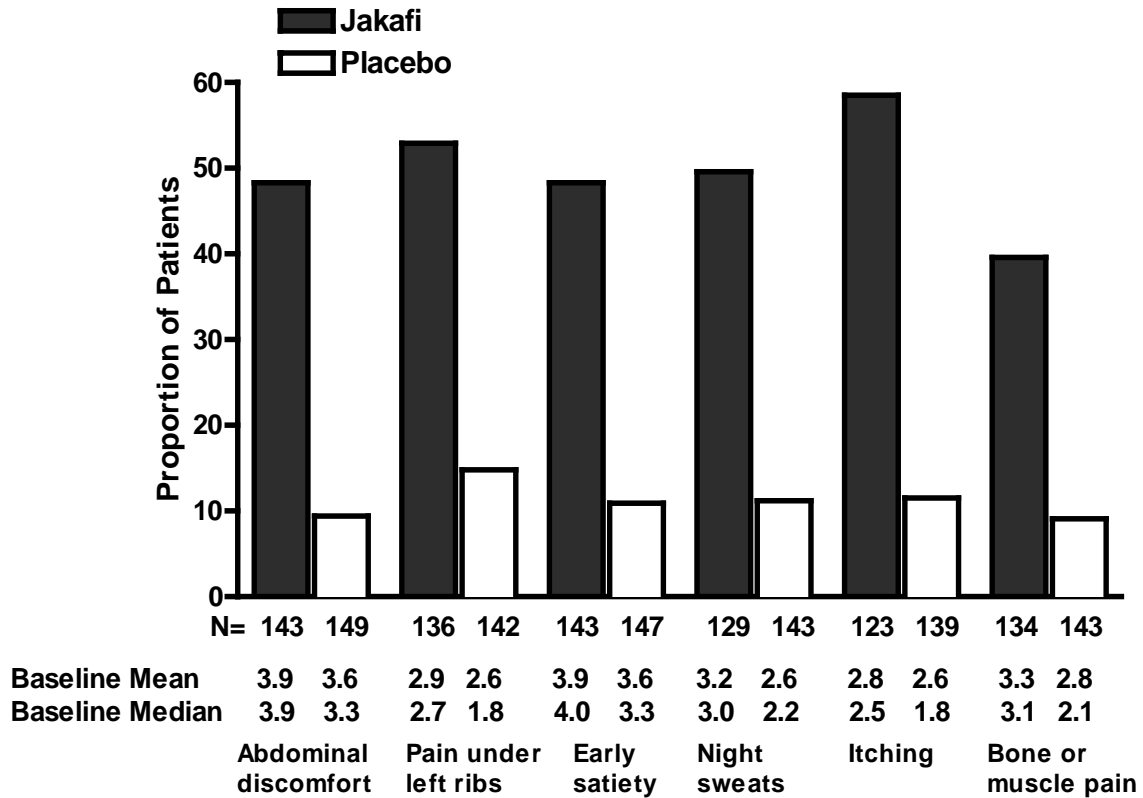
**Figure 2: Percent Change from Baseline in Total Symptom Score at Week 24 or Last Observation for Each Patient (Study 1)**



Worsening of Total Symptom Score is truncated at 150%.

Figure 3 displays the proportion of patients with at least a 50% improvement in each of the individual symptoms that comprise the Total Symptom Score indicating that all 6 of the symptoms contributed to the higher Total Symptom Score response rate in the group treated with Jakafi.

**Figure 3: Proportion of Patients With Myelofibrosis Achieving 50% or Greater Reduction in Individual Symptom Scores at Week 24**

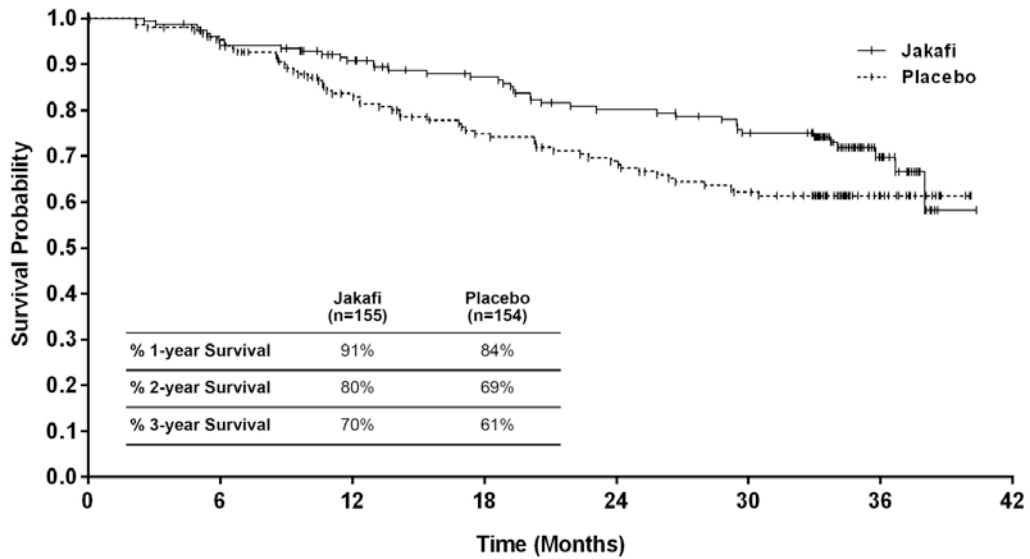


Individual score range = 0 to 10

Overall survival was a secondary endpoint in both Study 1 and Study 2. Patients in the control groups were eligible for crossover in both studies, and the median times to crossover were 9 months in Study 1 and 17 months in Study 2.

Figure 4 and Figure 5 show Kaplan-Meier curves of overall survival at prospectively planned analyses after all patients remaining on study had completed 144 weeks on study.

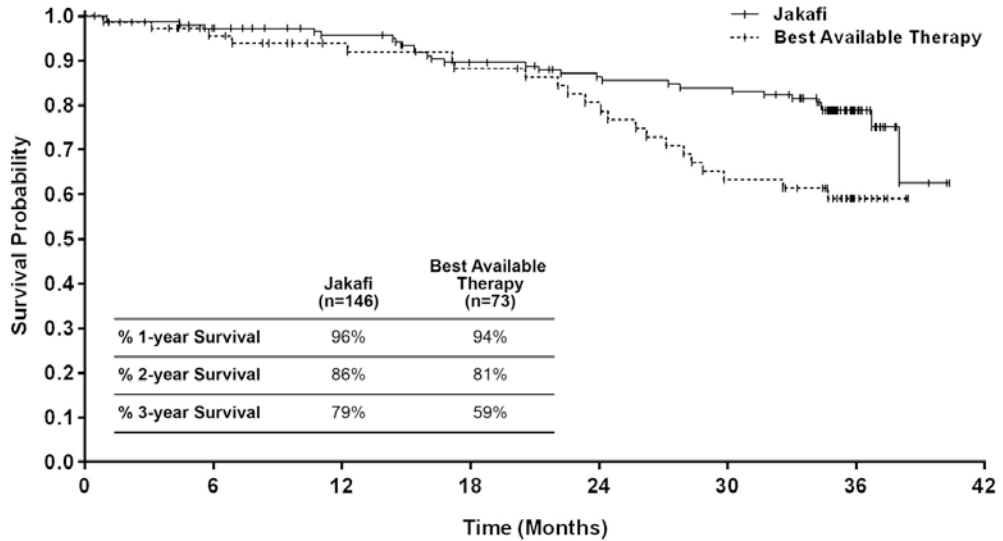
**Figure 4: Overall Survival - Kaplan-Meier Curves by Treatment Group in Study 1**



Number at Risk:

	0	6	12	18	24	30	36	42
Jakafi	155	145	134	122	111	102	29	0
Placebo	154	142	117	101	92	82	32	0

**Figure 5: Overall Survival - Kaplan-Meier Curves by Treatment Group in Study 2**



Number at Risk:

	0	6	12	18	24	30	36	42
Jakafi	146	135	126	115	107	104	33	0
Best Available Therapy	73	58	50	47	42	33	9	0

## 14.2 Polycythemia Vera

Study 3 was a randomized, open-label, active-controlled Phase 3 study conducted in 222 patients with polycythemia vera. Patients had been diagnosed with polycythemia vera for at least 24 weeks, had an inadequate response to or were intolerant of hydroxyurea, required phlebotomy and exhibited splenomegaly. All patients were required to demonstrate hematocrit control between 40-45% prior to randomization. The age ranged from 33 to 90 years with 30% of patients over 65 years of age and 66% were male. Patients had a median spleen volume as measured by MRI or CT of 1272 cm<sup>3</sup> (range 254 cm<sup>3</sup> to 5147 cm<sup>3</sup>) and median palpable spleen length below the costal margin was 7 cm.

Patients were randomized to Jakafi or best available therapy. The starting dose of Jakafi was 10 mg twice daily. Doses were then individualized based upon tolerability and efficacy with a maximum dose of 25 mg twice daily. At Week 32, 98 patients were still on Jakafi with 8% receiving greater than 20 mg twice daily, 15% receiving 20 mg twice daily, 33% receiving 15 mg twice daily, 34% receiving 10 mg twice daily, and 10% receiving less than 10 mg twice daily. Best available therapy (BAT) was selected by the investigator on a patient-by-patient basis and included hydroxyurea (60%), interferon/pegylated interferon (12%), anagrelide (7%), pibobroman (2%), lenalidomide/thalidomide (5%), and observation (15%).

The primary endpoint was the proportion of subjects achieving a response at Week 32, with response defined as having achieved both hematocrit control (the absence of phlebotomy eligibility beginning at the Week 8 visit and continuing through Week 32) and spleen volume reduction (a greater than or equal to 35% reduction from baseline in spleen volume at Week 32). Phlebotomy eligibility was defined as a confirmed hematocrit greater than 45% that is at least 3 percentage points higher than the hematocrit obtained at baseline or a confirmed hematocrit greater than 48%, whichever was lower. Secondary endpoints included the proportion of all randomized subjects who achieved the primary endpoint and who maintained their response 48 weeks after randomization, and the proportion of subjects achieving complete hematological remission at Week 32 with complete hematological remission defined as achieving hematocrit control, platelet count less than or equal to 400 X 10<sup>9</sup>/L, and white blood cell count less than or equal to 10 X 10<sup>9</sup>/L.

Results of the primary and secondary endpoints are presented in [Table 16](#). A significantly larger proportion of patients in the Jakafi group achieved a response for the primary endpoint compared to best available therapy at Week 32 and maintained their response 48 weeks after randomization. A significantly larger proportion of patients in the Jakafi group compared to best available therapy also achieved complete hematological remission at Week 32.

**Table 16: Percent of Patients with Polycythemia Vera Achieving the Primary and Key Secondary Endpoints (Intent to Treat)**

	<b>Jakafi (N=110)</b>	<b>Best Available Therapy (N=112)</b>
Number (%) of Patients Achieving a Primary Response at Week 32	23 (21%)	1 (<1%)
95% CI of the response rate (%)	(14%, 30%)	(0%, 5%)
P-value	< 0.0001	
Number (%) of Patients Achieving a Durable Primary Response at Week 48	21 (19%)	1 (<1%)
95% CI of the response rate (%)	(12%, 28%)	(0%, 5%)
P-value	< 0.0001	
Number (%) of Patients Achieving Complete Hematological Remission at Week 32	26 (24%)	10 (9%)
95% CI of the response rate (%)	(16%, 33%)	(4%, 16%)
P-value	0.0034	

Primary Response defined as having achieved both the absence of phlebotomy eligibility beginning at the Week 8 visit and continuing through Week 32 and a greater than or equal to 35% reduction from baseline in spleen volume at Week 32.

For the proportion of patients achieving each of the individual components that make up the primary endpoint at Week 32, there were 60% of the patients with hematocrit control in the Jakafi group vs. 20% of the patients in the best available therapy group. There were 38% of the patients with spleen volume reduction from baseline greater than or equal to 35% at Week 32 in the Jakafi group vs. less than 1% of the patients in the best available therapy group.

## 16. HOW SUPPLIED/STORAGE AND HANDLING

Jakafi (ruxolitinib) Tablets are available as follows:

### Jakafi Trade Presentations

<b>NDC Number</b>	<b>Strength</b>	<b>Description</b>	<b>Tablets per Bottle</b>
50881-005-60	5 mg	Round tablet with “INCY” on one side and “5” on the other	60
50881-010-60	10 mg	Round tablet with “INCY” on one side and “10” on the other	60
50881-015-60	15 mg	Oval tablet with “INCY” on one side and “15” on the other	60
50881-020-60	20 mg	Capsule shaped tablet with “INCY” on one side and “20” on the other	60
50881-025-60	25 mg	Oval tablet with “INCY” on one side and “25” on the other	60

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

## **17. PATIENT COUNSELING INFORMATION**

See FDA-approved patient labeling (Patient Information).

Discuss the following with patients prior to and during treatment with Jakafi:

### *Thrombocytopenia, Anemia and Neutropenia*

Inform patients that Jakafi is associated with thrombocytopenia, anemia and neutropenia, and of the need to monitor complete blood counts before and during treatment. Advise patients to observe for and report bleeding.

### *Infections*

Inform patients of the signs and symptoms of infection and to report any such signs and symptoms promptly.

Inform patients regarding the early signs and symptoms of herpes zoster and of progressive multifocal leukoencephalopathy, and advise patients to seek advice of a clinician if such symptoms are observed.

### *Symptom Exacerbation Following Interruption or Discontinuation of Treatment with Jakafi*

Inform patients that after discontinuation of treatment, signs and symptoms from myeloproliferative neoplasms are expected to return. Instruct patients not to interrupt or discontinue Jakafi therapy without consulting their physician.

### *Non-Melanoma Skin Cancer*

Inform patients that Jakafi may increase their risk of certain non-melanoma skin cancers. Advise patients to inform their healthcare provider if they have ever had any type of skin cancer or if they observe any new or changing skin lesions.

### *Drug-drug Interactions*

Advise patients to inform their healthcare providers of all medications they are taking, including over-the-counter medications, herbal products and dietary supplements.

### *Dialysis*

Inform patients on dialysis that their dose should not be taken before dialysis but only following dialysis.

### *Compliance*

Advise patients to continue taking Jakafi every day for as long as their physician tells them and that this is a long-term treatment. Patients should not change dose or stop taking Jakafi without first consulting their physician. Patients should be aware that after discontinuation of treatment, signs and symptoms from myeloproliferative neoplasms are expected to return.

Manufactured for:  
Incyte Corporation  
Wilmington, DE 19803

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U.S. Patent Nos. 7598257; 8415362; 8722693; 8822481; 8829013  
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## **Patient Information**

### **JAKAFI® (JAK-ah-fye)**

#### **(ruxolitinib)**

#### **tablets**

Read this Patient Information before you start taking Jakafi and each time you get a refill. There may be new information. This information does not take the place of talking to your healthcare provider about your medical condition or treatment.

#### **What is Jakafi?**

Jakafi is a prescription medicine used to treat certain types of myelofibrosis.

Jakafi is also used to treat people with polycythemia vera who have already taken a medicine called hydroxyurea and it did not work well enough or they could not tolerate it.

It is not known if Jakafi is safe or effective in children.

#### **What should I tell my healthcare provider before taking Jakafi?**

Before taking Jakafi, tell your healthcare provider if you:

- have an infection
- have or had tuberculosis (TB), or have been in close contact with someone who has TB
- have or have had liver problems
- have or have had kidney problems or are on dialysis. If you are on dialysis, Jakafi should be taken after your dialysis
- have had skin cancer in the past
- have any other medical conditions
- are pregnant or plan to become pregnant. It is not known if Jakafi will harm your unborn baby.
- are breastfeeding or plan to breastfeed. It is not known if Jakafi passes into your breast milk. You and your healthcare provider should decide if you will take Jakafi or breastfeed. You should not do both.

Tell your healthcare provider about all the medicines you take including prescription and over-the-counter medicines, vitamins and herbal supplements. Taking Jakafi with certain other medicines may affect how Jakafi works.

Especially tell your healthcare provider if you take medicine for:

- Fungal infections
- Bacterial infections
- HIV-AIDS



Ask your healthcare provider or pharmacist if you are not sure if your medicine is one listed above.

Know the medicines you take. Keep a list of them to show your healthcare provider and pharmacist when you get a new medicine.

### **How should I take Jakafi?**

- Take Jakafi exactly as your healthcare provider tells you.
- Do not change your dose or stop taking Jakafi without first talking to your healthcare provider.
- You can take Jakafi with or without food.
- Jakafi may also be given through certain nasogastric tubes.
  - Tell your healthcare provider if you cannot take Jakafi by mouth. Your healthcare provider will decide if you can take Jakafi through a nasogastric tube.
  - Ask your healthcare provider to give you specific instruction on how to properly take Jakafi through a nasogastric tube.
- Do not drink grapefruit juice while taking Jakafi. Grapefruit juice can affect the amount of Jakafi in your blood.
- If you take too much Jakafi call your healthcare provider or go to the nearest hospital emergency room department right away. Take the bottle of Jakafi with you.
- If you miss a dose of Jakafi, take your next dose at your regular time. Do not take 2 doses at the same time.
- You will have regular blood tests during your treatment with Jakafi. Your healthcare provider may change your dose of Jakafi or stop your treatment based on the results of your blood tests.

### **What are the possible side effects of Jakafi?**

#### **Jakafi can cause serious side effects including:**

**Low blood cell counts:** Jakafi may cause low platelet counts (thrombocytopenia), low red blood cell counts (anemia), and low white blood cell counts (neutropenia). If you develop bleeding, stop Jakafi and call your healthcare provider. Your healthcare provider will do a blood test to check your blood cell counts before you start Jakafi and regularly during your treatment with Jakafi. Tell your healthcare provider right away if you develop any of these symptoms:

- unusual bleeding
- bruising
- fatigue
- shortness of breath
- fever

**Infection:** You may be at risk for developing a serious infection during treatment with Jakafi. Tell your healthcare provider if you develop any of the following symptoms of infection:

- chills
- aches
- fever
- nausea
- vomiting
- weakness
- painful skin rash or blisters

**Skin cancers:** Some people who take Jakafi have developed certain types of non-melanoma skin cancers. Tell your healthcare provider if you develop any new or changing skin lesions during treatment with Jakafi.

**The most common side effects of Jakafi include:**

- anemia
- low platelet count
- bruising
- dizziness
- headache

Tell your healthcare provider about any side effect that bothers you or that does not go away.

These are not all the possible side effects of Jakafi. Ask your healthcare provider or pharmacist for more information.

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

You may also report side effects to Incyte Corporation at 1-855-463-3463.

**How should I store Jakafi?**

- Store Jakafi at room temperature between 68°F to 77°F (20°C to 25°C).

**Keep Jakafi and all medicines out of the reach of children.**

**General information about the safe and effective use of Jakafi:**

Medicines are sometimes prescribed for purposes other than those listed in Patient Information. Do not use Jakafi for a condition for which it is not prescribed. Do not give Jakafi to other people, even if they have the same symptoms you have. It may harm them.

This Patient Information leaflet summarizes the most important information about Jakafi. If you would like more information, talk with your healthcare provider. You can ask your pharmacist or healthcare provider for information that is written for healthcare professionals.

For more information call 1-855-463-3463 or go to [www.jakafi.com](http://www.jakafi.com).

**What are the ingredients in Jakafi?**

Active ingredient: ruxolitinib phosphate

Inactive ingredients: microcrystalline cellulose, lactose monohydrate, magnesium stearate, colloidal silicon dioxide, sodium starch glycolate, povidone and hydroxypropyl cellulose

This Patient Information has been approved by the U.S. Food and Drug Administration.

Manufactured for:  
Incyte Corporation  
Wilmington, DE 19803

Revised: December 2014

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