

**ANNEX I**  
**SUMMARY OF PRODUCT CHARACTERISTICS**

▼ This medicinal product is subject to additional monitoring. This will allow quick identification of new safety information. Healthcare professionals are asked to report any suspected adverse reactions. See section 4.8 for how to report adverse reactions.

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

KEYTRUDA 50 mg powder for concentrate for solution for infusion.

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

One vial of powder contains 50 mg of pembrolizumab.

After reconstitution, 1 mL of concentrate contains 25 mg of pembrolizumab.

Pembrolizumab is a humanised monoclonal anti-programmed cell death-1 (PD-1) antibody (IgG4/kappa isotype with a stabilising sequence alteration in the Fc region) produced in Chinese hamster ovary cells by recombinant DNA technology.

For the full list of excipients, see section 6.1.

## **3. PHARMACEUTICAL FORM**

Powder for concentrate for solution for infusion.

White to off-white lyophilised powder.

## **4. CLINICAL PARTICULARS**

### **4.1 Therapeutic indications**

KEYTRUDA as monotherapy is indicated for the treatment of advanced (unresectable or metastatic) melanoma in adults.

KEYTRUDA as monotherapy is indicated for the first-line treatment of metastatic non-small cell lung carcinoma (NSCLC) in adults whose tumours express PD-L1 with a  $\geq 50\%$  tumour proportion score (TPS) with no EGFR or ALK positive tumour mutations.

KEYTRUDA as monotherapy is indicated for the treatment of locally advanced or metastatic NSCLC in adults whose tumours express PD-L1 with a  $\geq 1\%$  TPS and who have received at least one prior chemotherapy regimen. Patients with EGFR or ALK positive tumour mutations should also have received targeted therapy before receiving KEYTRUDA.

KEYTRUDA as monotherapy is indicated for the treatment of adult patients with relapsed or refractory classical Hodgkin lymphoma (cHL) who have failed autologous stem cell transplant (ASCT) and brentuximab vedotin (BV), or who are transplant-ineligible and have failed BV.

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

Treatment must be initiated and supervised by specialist physicians experienced in the treatment of cancer.

### PD-L1 testing for patients with NSCLC

Patients with NSCLC should be selected for treatment based on the tumour expression of PD-L1 confirmed by a validated test (see section 5.1).

### Posology

KEYTRUDA should be administered as an intravenous infusion over 30 minutes every 3 weeks.

The recommended dose of KEYTRUDA is:

- 200 mg for NSCLC that has not been previously treated with chemotherapy or for cHL.
- 2 mg/kg for NSCLC that has been previously treated with chemotherapy or for melanoma.

Patients should be treated with KEYTRUDA until disease progression or unacceptable toxicity. Atypical responses (i.e., an initial transient increase in tumour size or small new lesions within the first few months followed by tumour shrinkage) have been observed. It is recommended to continue treatment for clinically stable patients with initial evidence of disease progression until disease progression is confirmed.

*Dose delay or discontinuation (see also section 4.4)*

**Table 1: Recommended treatment modifications for KEYTRUDA**

<b>Immune-related adverse reactions</b>	<b>Severity</b>	<b>Treatment modification</b>
Pneumonitis	Grade 2	Withhold*
	Grade 3 or 4, or recurrent Grade 2	Permanently discontinue
Colitis	Grade 2 or 3	Withhold*
	Grade 4	Permanently discontinue
Nephritis	Grade 2 with creatinine > 1.5 to ≤ 3 times upper limit of normal (ULN)	Withhold*
	Grade ≥ 3 with creatinine > 3 times ULN	Permanently discontinue
Endocrinopathies	Symptomatic hypophysitis Type 1 diabetes associated with Grade > 3 hyperglycaemia (glucose > 250 mg/dL or > 13.9 mmol/L) or associated with ketoacidosis Hyperthyroidism Grade ≥ 3	Withhold* For patients with Grade 3 or Grade 4 endocrinopathy that improved to Grade 2 or lower and is controlled with hormone replacement, if indicated, continuation of pembrolizumab may be considered after corticosteroid taper, if needed. Otherwise treatment should be discontinued. Hypothyroidism may be managed with replacement therapy without treatment interruption.
Hepatitis	Grade 2 with aspartate aminotransferase (AST) or alanine aminotransferase (ALT) > 3 to 5 times ULN or total bilirubin > 1.5 to 3 times ULN	Withhold*
	Grade ≥ 3 with AST or ALT > 5 times ULN or total bilirubin > 3 times ULN	Permanently discontinue

	In case of liver metastasis with baseline Grade 2 elevation of AST or ALT, hepatitis with AST or ALT increases $\geq 50\%$ and lasts $\geq 1$ week	Permanently discontinue
<b>Infusion-related reactions</b>	Grade 3 or 4	Permanently discontinue

Note: toxicity grades are in accordance with National Cancer Institute Common Terminology Criteria for Adverse Events Version 4.0 (NCI-CTCAE v.4).

\* until adverse reactions recover to Grade 0-1.

KEYTRUDA should be permanently discontinued:

- For Grade 4 toxicity except for:
  - endocrinopathies that are controlled with replacement hormones or
  - haematological toxicity, only in patients with cHL in which KEYTRUDA should be withheld until adverse reactions recover to Grade 0-1
- If corticosteroid dosing cannot be reduced to  $\leq 10$  mg prednisone or equivalent per day within 12 weeks
- If a treatment-related toxicity does not resolve to Grade 0-1 within 12 weeks after last dose of KEYTRUDA
- If any event occurs a second time at Grade  $\geq 3$  severity.

Patients treated with KEYTRUDA must be given the Patient Alert Card and be informed about the risks of KEYTRUDA (see also package leaflet).

#### Special populations

##### *Elderly*

No overall differences in safety or efficacy were reported between elderly patients ( $\geq 65$  years) and younger patients ( $< 65$  years). No dose adjustment is necessary in this population.

Data from patients  $\geq 65$  years are too limited to draw conclusions on cHL population (see section 5.1).

##### *Renal impairment*

No dose adjustment is needed for patients with mild or moderate renal impairment. KEYTRUDA has not been studied in patients with severe renal impairment (see sections 4.4 and 5.2).

##### *Hepatic impairment*

No dose adjustment is needed for patients with mild hepatic impairment. KEYTRUDA has not been studied in patients with moderate or severe hepatic impairment (see sections 4.4 and 5.2).

##### *Ocular melanoma*

There are limited data on the safety and efficacy of KEYTRUDA in patients with ocular melanoma (see section 5.1).

##### *Eastern Cooperative Oncology Group (ECOG) performance status score $\geq 2$*

Patients with ECOG performance status score  $\geq 2$  were excluded from the clinical trials (see sections 4.4 and 5.1).

##### *Paediatric population*

The safety and efficacy of KEYTRUDA in children below 18 years of age have not yet been established. No data are available.

#### Method of administration

KEYTRUDA must be administered by intravenous infusion over 30 minutes. KEYTRUDA must not be administered as an intravenous push or bolus injection.

For instructions on reconstitution and dilution of the medicinal product before administration, see section 6.6.

### 4.3 Contraindications

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

### 4.4 Special warnings and precautions for use

#### Assessment of PD-L1 status

When assessing the PD-L1 status of the tumour, it is important that a well-validated and robust methodology is chosen to minimise false negative or false positive determinations.

#### Immune-related adverse reactions

Most immune-related adverse reactions occurring during treatment with pembrolizumab were reversible and managed with interruptions of pembrolizumab, administration of corticosteroids and/or supportive care. Immune-related adverse reactions have also occurred after the last dose of pembrolizumab. Immune-related adverse reactions affecting more than one body system can occur simultaneously.

For suspected immune-related adverse reactions, adequate evaluation to confirm aetiology or exclude other causes should be ensured. Based on the severity of the adverse reaction, pembrolizumab should be withheld and corticosteroids administered. Upon improvement to Grade  $\leq 1$ , corticosteroid taper should be initiated and continued over at least 1 month. Based on limited data from clinical studies in patients whose immune-related adverse reactions could not be controlled with corticosteroid use, administration of other systemic immunosuppressants can be considered.

Pembrolizumab may be restarted within 12 weeks after last dose of KEYTRUDA if the adverse reaction remains at Grade  $\leq 1$  and corticosteroid dose has been reduced to  $\leq 10$  mg prednisone or equivalent per day.

Pembrolizumab must be permanently discontinued for any Grade 3 immune-related adverse reaction that recurs and for any Grade 4 immune-related adverse reaction toxicity, except for endocrinopathies that are controlled with replacement hormones (see sections 4.2 and 4.8).

#### *Immune-related pneumonitis*

Pneumonitis, including fatal cases, has been reported in patients receiving pembrolizumab (see section 4.8). Patients should be monitored for signs and symptoms of pneumonitis. Suspected pneumonitis should be confirmed with radiographic imaging and other causes excluded.

Corticosteroids should be administered for Grade  $\geq 2$  events (initial dose of 1-2 mg/kg/day prednisone or equivalent followed by a taper); pembrolizumab should be withheld for Grade 2 pneumonitis, and permanently discontinued for Grade 3, Grade 4 or recurrent Grade 2 pneumonitis (see section 4.2).

#### *Immune-related colitis*

Colitis has been reported in patients receiving pembrolizumab (see section 4.8). Patients should be monitored for signs and symptoms of colitis, and other causes excluded. Corticosteroids should be administered for Grade  $\geq 2$  events (initial dose of 1-2 mg/kg/day prednisone or equivalent followed by a taper); pembrolizumab should be withheld for Grade 2 or Grade 3 colitis, and permanently discontinued for Grade 4 colitis (see section 4.2). The potential risk of gastrointestinal perforation should be taken into consideration.

#### *Immune-related hepatitis*

Hepatitis has been reported in patients receiving pembrolizumab (see section 4.8). Patients should be monitored for changes in liver function (at the start of treatment, periodically during treatment and as indicated based on clinical evaluation) and symptoms of hepatitis, and other causes excluded.

Corticosteroids should be administered (initial dose of 0.5-1 mg/kg/day (for Grade 2 events) and 1-2 mg/kg/day (for Grade  $\geq$  3 events) prednisone or equivalent followed by a taper) and, based on severity of liver enzyme elevations, pembrolizumab should be withheld or discontinued (see section 4.2).

#### *Immune-related nephritis*

Nephritis has been reported in patients receiving pembrolizumab (see section 4.8). Patients should be monitored for changes in renal function, and other causes of renal dysfunction excluded.

Corticosteroids should be administered for Grade  $\geq$  2 events (initial dose of 1-2 mg/kg/day prednisone or equivalent followed by a taper) and, based on severity of creatinine elevations, pembrolizumab should be withheld for Grade 2, and permanently discontinued for Grade 3 or Grade 4 nephritis (see section 4.2).

#### *Immune-related endocrinopathies*

Severe endocrinopathies, including hypophysitis, type 1 diabetes mellitus, diabetic ketoacidosis, hypothyroidism, and hyperthyroidism have been observed with pembrolizumab treatment.

Long-term hormone replacement therapy may be necessary in cases of immune-related endocrinopathies.

Hypophysitis has been reported in patients receiving pembrolizumab (see section 4.8). Patients should be monitored for signs and symptoms of hypophysitis (including hypopituitarism and secondary adrenal insufficiency) and other causes excluded. Corticosteroids to treat secondary adrenal insufficiency and other hormone replacement should be administered as clinically indicated, and pembrolizumab should be withheld for symptomatic hypophysitis until the event is controlled with hormone replacement. Continuation of pembrolizumab may be considered, after corticosteroid taper, if needed (see section 4.2). Pituitary function and hormone levels should be monitored to ensure appropriate hormone replacement.

Type 1 diabetes mellitus, including diabetic ketoacidosis, has been reported in patients receiving pembrolizumab (see section 4.8). Patients should be monitored for hyperglycaemia or other signs and symptoms of diabetes. Insulin should be administered for type 1 diabetes, and pembrolizumab should be withheld in cases of Grade 3 hyperglycaemia until metabolic control is achieved (see section 4.2).

Thyroid disorders, including hypothyroidism, hyperthyroidism and thyroiditis, have been reported in patients receiving pembrolizumab and can occur at any time during treatment; therefore, patients should be monitored for changes in thyroid function (at the start of treatment, periodically during treatment and as indicated based on clinical evaluation) and clinical signs and symptoms of thyroid disorders. Hypothyroidism may be managed with replacement therapy without treatment interruption and without corticosteroids. Hyperthyroidism may be managed symptomatically. Pembrolizumab should be withheld for Grade  $\geq$  3 until recovery to Grade  $\leq$  1 hyperthyroidism. For patients with Grade 3 or Grade 4 hyperthyroidism that improved to Grade 2 or lower, continuation of pembrolizumab may be considered, after corticosteroid taper, if needed (see sections 4.2 and 4.8). Thyroid function and hormone levels should be monitored to ensure appropriate hormone replacement.

#### *Other immune-related adverse reactions*

The following additional clinically significant, immune-related adverse reactions have been reported in patients receiving pembrolizumab: uveitis, arthritis, myositis, pancreatitis, severe skin reactions, Guillain-Barré syndrome, myasthenic syndrome, haemolytic anaemia and partial seizures arising in a patient with inflammatory foci in brain parenchyma (see section 4.8).

Immune-related adverse reactions, including severe and fatal cases, have been reported in clinical trials or in post-marketing experience.

Based on the severity of the adverse reaction, pembrolizumab should be withheld and corticosteroids administered.

Pembrolizumab may be restarted within 12 weeks after last dose of KEYTRUDA if the adverse reaction remains at Grade  $\leq 1$  and corticosteroid dose has been reduced to  $\leq 10$  mg prednisone or equivalent per day.

Pembrolizumab must be permanently discontinued for any Grade 3 immune related adverse reaction that recurs and for any Grade 4 immune related adverse reaction toxicity (see sections 4.2 and 4.8).

#### Infusion-related reactions

Severe infusion-related reactions have been reported in patients receiving pembrolizumab (see section 4.8). For severe infusion reactions, infusion should be stopped and pembrolizumab permanently discontinued (see section 4.2). Patients with mild or moderate infusion reaction may continue to receive pembrolizumab with close monitoring; premedication with antipyretic and antihistamine may be considered.

#### Complications of allogeneic Haematopoietic Stem Cell Transplant (HSCT) in classical Hodgkin lymphoma

Cases of GVHD and hepatic veno-occlusive disease (VOD) have been observed in patients undergoing allogeneic HSCT after previous exposure to pembrolizumab. Until further data become available, careful consideration to the potential benefits of HSCT and the possible increased risk of transplant-related complications should be made case by case (see section 4.8).

#### Patients excluded from clinical trials

Patients with the following conditions were excluded from clinical trials: active CNS metastases; ECOG PS  $\geq 2$ ; HIV, hepatitis B or hepatitis C infection; active systemic autoimmune disease; interstitial lung disease; prior pneumonitis requiring systemic corticosteroid therapy; a history of severe hypersensitivity to another monoclonal antibody; receiving immunosuppressive therapy and a history of severe immune-related adverse reactions from treatment with ipilimumab, defined as any Grade 4 toxicity or Grade 3 toxicity requiring corticosteroid treatment ( $> 10$  mg/day prednisone or equivalent) for greater than 12 weeks. Patients with active infections were excluded from clinical trials and were required to have their infection treated prior to receiving pembrolizumab. Patients with active infections occurring during treatment with pembrolizumab were managed with appropriate medical therapy. Patients with clinically significant renal (creatinine  $> 1.5$  x ULN) or hepatic (bilirubin  $> 1.5$  x ULN, ALT, AST  $> 2.5$  x ULN in the absence of liver metastases) abnormalities at baseline were excluded from clinical trials, therefore information is limited in patients with severe renal and moderate to severe hepatic impairment.

For subjects with relapsed or refractory classical Hodgkin lymphoma, clinical data for the use of pembrolizumab in patients ineligible to ASCT due to reasons other than failure to salvage chemotherapy are limited (see section 5.1).

After careful consideration of the potential increased risk, pembrolizumab may be used with appropriate medical management in these patients.

#### Patient Alert Card

All prescribers of KEYTRUDA must be familiar with the Physician Information and Management Guidelines. The prescriber must discuss the risks of KEYTRUDA therapy with the patient. The patient will be provided with the Patient Alert Card with each prescription.

#### **4.5 Interaction with other medicinal products and other forms of interaction**

No formal pharmacokinetic drug interaction studies have been conducted with pembrolizumab. Since pembrolizumab is cleared from the circulation through catabolism, no metabolic drug-drug interactions are expected.

The use of systemic corticosteroids or immunosuppressants before starting pembrolizumab should be avoided because of their potential interference with the pharmacodynamic activity and efficacy of pembrolizumab. However, systemic corticosteroids or other immunosuppressants can be used after starting pembrolizumab to treat immune-related adverse reactions (see section 4.4).

#### **4.6 Fertility, pregnancy and lactation**

##### Women of childbearing potential

Women of childbearing potential should use effective contraception during treatment with pembrolizumab and for at least 4 months after the last dose of pembrolizumab.

##### Pregnancy

There are no data on the use of pembrolizumab in pregnant women. Animal reproduction studies have not been conducted with pembrolizumab; however, in murine models of pregnancy blockade of PD-L1 signaling has been shown to disrupt tolerance to the foetus and to result in an increased foetal loss (see section 5.3). These results indicate a potential risk, based on its mechanism of action, that administration of pembrolizumab during pregnancy could cause foetal harm, including increased rates of abortion or stillbirth. Human immunoglobulins G4 (IgG4) are known to cross the placental barrier; therefore, being an IgG4, pembrolizumab has the potential to be transmitted from the mother to the developing foetus. Pembrolizumab should not be used during pregnancy unless the clinical condition of the woman requires treatment with pembrolizumab.

##### Breast-feeding

It is unknown whether pembrolizumab is secreted in human milk. Since it is known that antibodies can be secreted in human milk, a risk to the newborns/infants cannot be excluded. A decision should be made whether to discontinue breast-feeding or to discontinue pembrolizumab, taking into account the benefit of breast-feeding for the child and the benefit of pembrolizumab therapy for the woman.

##### Fertility

No clinical data are available on the possible effects of pembrolizumab on fertility. There were no notable effects in the male and female reproductive organs in monkeys based on 1-month and 6-month repeat dose toxicity studies (see section 5.3).

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

Pembrolizumab may have a minor influence on the ability to drive and use machines. Fatigue has been reported following administration of pembrolizumab (see section 4.8).

#### **4.8 Undesirable effects**

##### Summary of the safety profile

Pembrolizumab is most commonly associated with immune-related adverse reactions. Most of these, including severe reactions, resolved following initiation of appropriate medical therapy or withdrawal of pembrolizumab (see “Description of selected adverse reactions” below).

The safety of pembrolizumab has been evaluated in 3,194 patients with advanced melanoma, NSCLC or cHL across four doses (2 mg/kg every 3 weeks, 200 mg every 3 weeks, or 10 mg/kg every 2 or 3 weeks) in clinical studies. In this patient population, the most common adverse reactions (> 10%) with pembrolizumab were fatigue (22%), pruritus (15%), rash (13%), diarrhoea (12%) and



nausea (10%). The majority of adverse reactions reported were of Grade 1 or 2 severity. The most serious adverse reactions were immune-related adverse reactions and severe infusion-related reactions (see section 4.4).

#### Tabulated list of adverse reactions

Adverse reactions reported in 3,194 patients treated with pembrolizumab in clinical trials are reported in Table 2. These reactions are presented by system organ class and by frequency. Frequencies are defined as: very common ( $\geq 1/10$ ); common ( $\geq 1/100$  to  $< 1/10$ ); uncommon ( $\geq 1/1,000$  to  $< 1/100$ ); rare ( $\geq 1/10,000$  to  $< 1/1,000$ ); very rare ( $< 1/10,000$ ). Within each frequency grouping, adverse reactions are presented in the order of decreasing seriousness.

**Table 2: Adverse reactions in patients treated with pembrolizumab in clinical trials**

<b>Blood and lymphatic system disorders</b>	
Common	anaemia
Uncommon	neutropenia, thrombocytopenia, leukopenia, lymphopenia, eosinophilia
Rare	immune thrombocytopenic purpura, haemolytic anaemia
<b>Immune system disorders</b>	
Common	infusion related reaction <sup>a</sup>
<b>Endocrine disorders</b>	
Common	hyperthyroidism, hypothyroidism <sup>b</sup>
Uncommon	hypophysitis <sup>c</sup> , adrenal insufficiency, thyroiditis
<b>Metabolism and nutrition disorders</b>	
Common	decreased appetite
Uncommon	type 1 diabetes mellitus <sup>d</sup> , hyponatraemia, hypokalaemia, hypocalcaemia
<b>Psychiatric disorders</b>	
Uncommon	insomnia
<b>Nervous system disorders</b>	
Common	headache, dizziness, dysgeusia
Uncommon	epilepsy, lethargy, neuropathy peripheral
Rare	Guillain-Barré syndrome, myasthenic syndrome
<b>Eye disorders</b>	
Common	dry eye
Uncommon	uveitis <sup>e</sup>
<b>Vascular disorders</b>	
Uncommon	hypertension
<b>Respiratory, thoracic and mediastinal disorders</b>	
Common	pneumonitis <sup>f</sup> , dyspnea, cough
<b>Gastrointestinal disorders</b>	
Very common	diarrhoea, nausea
Common	colitis <sup>g</sup> , vomiting, abdominal pain <sup>h</sup> , constipation, dry mouth
Uncommon	pancreatitis <sup>i</sup>
Rare	small intestinal perforation
<b>Hepatobiliary disorders</b>	
Uncommon	hepatitis <sup>j</sup>
<b>Skin and subcutaneous tissue disorders</b>	
Very common	rash <sup>k</sup> , pruritus <sup>l</sup>
Common	severe skin reactions <sup>m</sup> , vitiligo <sup>n</sup> , dry skin, erythema, eczema
Uncommon	lichenoid keratosis <sup>o</sup> , psoriasis, alopecia, dermatitis, dermatitis acneiform, hair colour changes, papule
Rare	erythema nodosum
<b>Musculoskeletal and connective tissue disorders</b>	
Common	arthralgia, myositis <sup>p</sup> , musculoskeletal pain <sup>q</sup> , pain in extremity, arthritis <sup>r</sup>
Uncommon	tenosynovitis <sup>s</sup>

<b>Renal and urinary disorders</b>	
Uncommon	nephritis <sup>†</sup>
<b>General disorders and administration site conditions</b>	
Very common	fatigue
Common	asthenia, oedema <sup>u</sup> , pyrexia, influenza like illness, chills
<b>Investigations</b>	
Common	alanine aminotransferase increased, aspartate aminotransferase increased, blood alkaline phosphatase increased, blood creatinine increased
Uncommon	amylase increased, blood bilirubin increased, hypercalcaemia

The following terms represent a group of related events that describe a medical condition rather than a single event.

- a. infusion-related reactions (drug hypersensitivity, anaphylactic reaction, hypersensitivity and cytokine release syndrome)
- b. hypothyroidism (myxoedema)
- c. hypophysitis (hypopituitarism)
- d. type 1 diabetes mellitus (diabetic ketoacidosis)
- e. uveitis (iritis and iridocyclitis)
- f. pneumonitis (interstitial lung disease)
- g. colitis (colitis microscopic and enterocolitis)
- h. abdominal pain (abdominal discomfort, abdominal pain upper and abdominal pain lower)
- i. pancreatitis (autoimmune pancreatitis and pancreatitis acute)
- j. hepatitis (autoimmune hepatitis and drug induced liver injury)
- k. rash (rash erythematous, rash follicular, rash generalised, rash macular, rash maculo-papular, rash papular, rash pruritic, rash vesicular and genital rash)
- l. pruritus (urticaria, urticaria papular, pruritus generalized and pruritus genital)
- m. severe skin reactions (dermatitis exfoliative, erythema multiforme, exfoliative rash, pemphigoid, Stevens-Johnson syndrome and Grade  $\geq 3$  of the following: pruritus, rash, rash generalised and rash maculo-papular, dermatitis psoriasiform)
- n. vitiligo (skin depigmentation, skin hypopigmentation and hypopigmentation of the eyelid)
- o. lichenoid keratosis (lichen planus and lichen sclerosus)
- p. myositis (myalgia, myopathy, polymyalgia rheumatica and rhabdomyolysis)
- q. musculoskeletal pain (musculoskeletal discomfort, back pain, musculoskeletal stiffness, musculoskeletal chest pain and torticollis)
- r. arthritis (joint swelling, polyarthritis and joint effusion)
- s. tenosynovitis (tendonitis, synovitis and tendon pain)
- t. nephritis (nephritis autoimmune, tubulointerstitial nephritis and renal failure or renal failure acute with evidence of nephritis, nephrotic syndrome)
- u. oedema (oedema peripheral, generalised oedema, fluid overload, fluid retention, eyelid oedema and lip oedema, face oedema, localized oedema and periorbital oedema)

#### Description of selected adverse reactions

Data for the following immune-related adverse reactions are based on patients who received pembrolizumab across three doses (2 mg/kg every 3 weeks or 10 mg/kg every 2 or 3 weeks) in clinical studies (see section 5.1). The management guidelines for these adverse reactions are described in section 4.4.

#### Immune-related adverse reactions (see section 4.4)

##### *Immune-related pneumonitis*

Pneumonitis occurred in 113 (3.5%) patients, including Grade 2, 3, 4 or 5 cases in 49 (1.5%), 27 (0.8%), 9 (0.3%) and 4 (0.1%) patients, respectively, receiving pembrolizumab. The median time to onset of pneumonitis was 3.1 months (range 2 days to 19.3 months). The median duration was 1.9 months (range 1 day to 17.2+ months). Pneumonitis led to discontinuation of pembrolizumab in 48 (1.5%) patients. Pneumonitis resolved in 68 patients, 1 with sequelae.

##### *Immune-related colitis*

Colitis occurred in 56 (1.8%) patients, including Grade 2, 3 or 4 cases in 12 (0.4%), 35 (1.1%) and 2 (<0.1%) patients, respectively, receiving pembrolizumab. The median time to onset of colitis was 3.5 months (range 7 days to 16.2 months). The median duration was 1.4 months (range 1 day to

8.7+ months). Colitis led to discontinuation of pembrolizumab in 15 (0.5%) patients. Colitis resolved in 47 patients.

#### *Immune-related hepatitis*

Hepatitis occurred in 19 (0.6%) patients, including Grade 2, 3 or 4 cases in 4 (0.1%), 12 (0.4%) and 2 (<0.1%) patients, respectively, receiving pembrolizumab. The median time to onset of hepatitis was 1.3 months (range 8 days to 21.4 months). The median duration was 1.8 months (range 8 days to 20.9+ months). Hepatitis led to discontinuation of pembrolizumab in 6 (0.2%) patients. Hepatitis resolved in 15 patients.

#### *Immune-related nephritis*

Nephritis occurred in 11 (0.3%) patients, including Grade 2, 3 or 4 cases in 3 (0.1%), 6 (0.2%) and 1 (<0.1%) patients, respectively, receiving pembrolizumab. The median time to onset of nephritis was 4.9 months (range 12 days to 12.8 months). The median duration was 3.3 months (range 12 days to 10.5+ months). Nephritis led to discontinuation of pembrolizumab in 4 (0.1%) patients. Nephritis resolved in 6 patients.

#### *Immune-related endocrinopathies*

Hypophysitis occurred in 18 (0.6%) patients, including Grade 2, 3 or 4 cases in 6 (0.2%), 9 (0.3%) and 1 (<0.1%) patients, respectively, receiving pembrolizumab. The median time to onset of hypophysitis was 4.0 months (range 1 day to 11.9 months). The median duration was 4.7 months (range 8+ days to 12.7+ months). Hypophysitis led to discontinuation of pembrolizumab in 4 (0.1%) patients. Hypophysitis resolved in 7 patients, 2 with sequelae.

Hyperthyroidism occurred in 115 (3.6%) patients, including Grade 2 or 3 cases in 27 (0.8%) and 4 (0.1%) patients, respectively, receiving pembrolizumab. The median time to onset of hyperthyroidism was 1.4 months (range 1 day to 21.9 months). The median duration was 2.0 months (range 10 days to 15.0+ months). Hyperthyroidism led to discontinuation of pembrolizumab in 2 (0.1%) patients. Hyperthyroidism resolved in 88 (77%) patients, 1 with sequelae.

Hypothyroidism occurred in 285 (8.9%) patients, including Grade 2 or 3 cases in 204 (6.4%) and 4 (0.1%) patients, respectively, receiving pembrolizumab. The median time to onset of hypothyroidism was 3.5 months (range 1 day to 18.9 months). The median duration was not reached (range 2 days to 29.9+ months). One patient (<0.1%) discontinued pembrolizumab due to hypothyroidism. Hypothyroidism resolved in 67 (24%) patients, 4 with sequelae. In patients with cHL (n=241) the incidence of hypothyroidism was 14.1% (all Grades) with 0.4% Grade 3.

#### *Complications of allogeneic HSCT in classical Hodgkin lymphoma*

Of 23 patients with cHL who proceeded to allogeneic HSCT after treatment with pembrolizumab, 6 patients (26%) developed graft-versus-host-disease (GVHD), one of which was fatal, and 2 patients (9%) developed severe hepatic VOD after reduced-intensity conditioning, one of which was fatal. The 23 patients had a median follow-up from subsequent allogeneic HSCT of 5.1 months (range: 0-26.2 months).

#### Immunogenicity

In clinical studies in patients treated with pembrolizumab 2 mg/kg every 3 weeks, 200 mg every 3 weeks, or 10 mg/kg every two or three weeks, 29 (1.8%) of 1,619 evaluable patients tested positive for treatment-emergent antibodies to pembrolizumab. There was no evidence of an altered pharmacokinetic or safety profile with anti-pembrolizumab binding antibody development.

#### Reporting of suspected adverse reactions

Reporting suspected adverse reactions after authorisation of the medicinal product is important. It allows continued monitoring of the benefit/risk balance of the medicinal product. Healthcare professionals are asked to report any suspected adverse reactions via [the national reporting system listed in Appendix V](#).

## 4.9 Overdose

There is no information on overdose with pembrolizumab.

In case of overdose, patients must be closely monitored for signs or symptoms of adverse reactions, and appropriate symptomatic treatment instituted.

## 5. PHARMACOLOGICAL PROPERTIES

### 5.1 Pharmacodynamic properties

Pharmacotherapeutic group: Antineoplastic agents, monoclonal antibodies. ATC code: L01XC18

#### Mechanism of action

KEYTRUDA is a humanised monoclonal antibody which binds to the programmed cell death-1 (PD-1) receptor and blocks its interaction with ligands PD-L1 and PD-L2. The PD-1 receptor is a negative regulator of T-cell activity that has been shown to be involved in the control of T-cell immune responses. KEYTRUDA potentiates T-cell responses, including anti-tumour responses, through blockade of PD-1 binding to PD-L1 and PD-L2, which are expressed in antigen presenting cells and may be expressed by tumours or other cells in the tumour microenvironment.

#### Clinical efficacy and safety

##### Melanoma

##### KEYNOTE-006: Controlled trial in melanoma patients naïve to treatment with ipilimumab

The safety and efficacy of pembrolizumab were investigated in KEYNOTE-006, a multicentre, controlled, Phase III study for the treatment of advanced melanoma in patients who were naïve to ipilimumab. Patients were randomised (1:1:1) to receive pembrolizumab 10 mg/kg every 2 (n=279) or 3 weeks (n=277) or ipilimumab 3 mg/kg every 3 weeks (n=278). Patients with BRAF V600E mutant melanoma were not required to have received prior BRAF inhibitor therapy.

Patients were treated with pembrolizumab until disease progression or unacceptable toxicity. Clinically stable patients with initial evidence of disease progression were permitted to remain on treatment until disease progression was confirmed. Assessment of tumour status was performed at 12 weeks, then every 6 weeks through week 48, followed by every 12 weeks thereafter.

Of the 834 patients, 60% were male, 44% were  $\geq 65$  years (median age was 62 years [range 18-89]) and 98% were white. Sixty-five percent of patients had M1c stage, 9% had a history of brain metastases, 66% had no and 34% had one prior therapy. Thirty-one percent had an ECOG Performance Status of 1, 69% had ECOG Performance Status of 0 and 32% had elevated LDH. BRAF mutations were reported in 302 (36%) patients. Among patients with BRAF mutant tumours, 139 (46%) were previously treated with a BRAF inhibitor.

The primary efficacy outcome measures were progression free survival (PFS; as assessed by Integrated Radiology and Oncology Assessment [IRO] review using Response Evaluation Criteria in Solid Tumours [RECIST], version 1.1) and overall survival (OS). Secondary efficacy outcome measures were overall response rate (ORR) and response duration. Table 3 summarises key efficacy measures in patients naïve to treatment with ipilimumab, and the Kaplan-Meier curves for OS and PFS are shown in Figures 1 and 2.

**Table 3: Response to pembrolizumab 10 mg/kg every 2 or 3 weeks in patients with ipilimumab naïve advanced melanoma in KEYNOTE-006\***

Endpoint	Pembrolizumab 10 mg/kg every 3 weeks n=277	Pembrolizumab 10 mg/kg every 2 weeks n=279	Ipilimumab 3 mg/kg every 3 weeks n=278
<b>OS</b>			
Number (%) of patients with event	92 (33%)	85 (30%)	112 (40%)
Hazard ratio* (95% CI)	0.69 (0.52, 0.90)	0.63 (0.47, 0.83)	---
p-Value <sup>†</sup>	0.00358	0.00052	---
Median in months (95% CI)	Not reached (NA, NA)	Not reached (NA, NA)	Not reached (13, NA)
<b>PFS</b>			
Number (%) of patients with event	157 (57%)	157 (56%)	188 (68%)
Hazard ratio* (95% CI)	0.58 (0.47, 0.72)	0.58 (0.46, 0.72)	---
p-Value <sup>†</sup>	< 0.00001	< 0.00001	---
Median in months (95% CI)	4.1 (2.9, 6.9)	5.5 (3.4, 6.9)	2.8 (2.8, 2.9)
<b>Best overall response</b>			
ORR % (95% CI)	33% (27, 39)	34% (28, 40)	12% (8, 16)
Complete response %	6%	5%	1%
Partial response %	27%	29%	10%
<b>Response duration<sup>‡</sup></b>			
Median in months (range)	Not reached (1.4+, 8.1+)	8.3 (1.4+, 8.3)	Not reached (1.1+, 7.9+)
% ongoing	97%	89%	88%

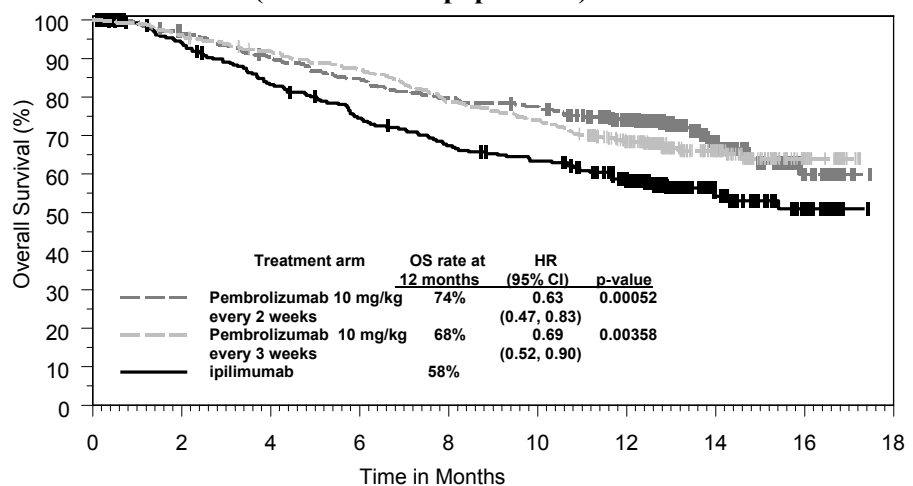
\* Hazard ratio (pembrolizumab compared to ipilimumab) based on the stratified Cox proportional hazard model

<sup>†</sup> Based on stratified Log rank test

<sup>‡</sup> Based on patients with a best overall response as confirmed complete or partial response

NA = not available

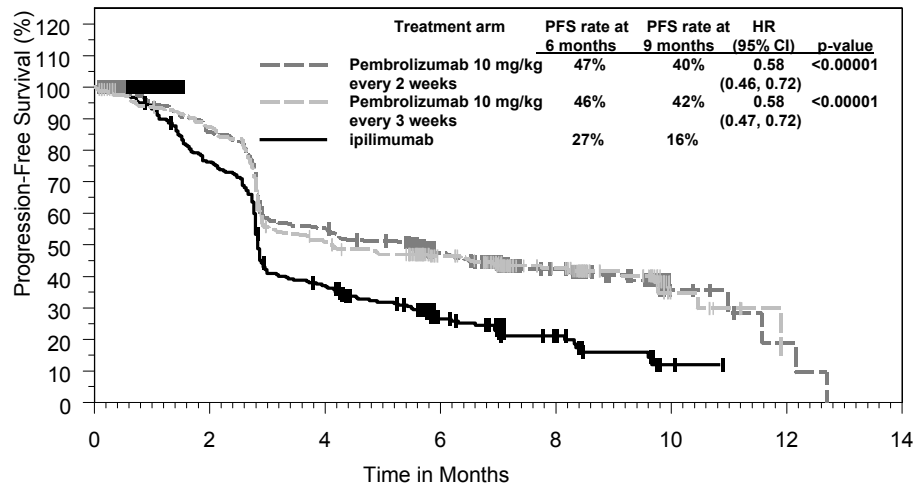
**Figure 1: Kaplan-Meier curve for overall survival by treatment arm in KEYNOTE-006 (intent to treat population)**



Number at Risk

Pembrolizumab 10 mg/kg every 2 weeks:	279	266	248	233	219	212	177	67	19	0
Pembrolizumab 10 mg/kg every 3 weeks:	277	266	251	238	215	202	158	71	18	0
ipilimumab:	278	242	212	188	169	157	117	51	17	0

**Figure 2: Kaplan-Meier curve for progression-free survival by treatment arm in KEYNOTE-006 (intent to treat population)**



Number at Risk	0	2	4	6	8	10	12	14
Pembrolizumab 10 mg/kg every 2 weeks:	279	231	147	98	49	7	2	0
Pembrolizumab 10 mg/kg every 3 weeks:	277	235	133	95	53	7	1	1
ipilimumab:	278	186	88	42	18	2	0	0

***KEYNOTE-002: Controlled trial in melanoma patients previously treated with ipilimumab***

The safety and efficacy of pembrolizumab were investigated in KEYNOTE-002, a multicentre, controlled study for the treatment of advanced melanoma in patients previously treated with ipilimumab and if BRAF V600 mutation-positive, with a BRAF or MEK inhibitor. Patients were randomised (1:1:1) to receive pembrolizumab at a dose of 2 (n=180) or 10 mg/kg (n=181) every 3 weeks or chemotherapy (n=179; including dacarbazine, temozolomide, carboplatin, paclitaxel, or carboplatin+paclitaxel). The study excluded patients with autoimmune disease or those receiving immunosuppression; further exclusion criteria were a history of severe or life-threatening immune-related adverse reactions from treatment with ipilimumab, defined as any Grade 4 toxicity or Grade 3 toxicity requiring corticosteroid treatment (> 10 mg/day prednisone or equivalent dose) for greater than 12 weeks; ongoing adverse reactions ≥ Grade 2 from previous treatment with ipilimumab; previous severe hypersensitivity to other monoclonal antibodies; a history of pneumonitis or interstitial lung disease; HIV, hepatitis B or hepatitis C infection and ECOG Performance Status ≥ 2.

Patients were treated with pembrolizumab until disease progression or unacceptable toxicity. Clinically stable patients with initial evidence of disease progression were permitted to remain on treatment until disease progression was confirmed. Assessment of tumour status was performed at 12 weeks, then every 6 weeks through week 48, followed by every 12 weeks thereafter. Patients on chemotherapy who experienced independently verified progression of disease after the first scheduled disease assessment were able to crossover and receive 2 mg/kg or 10 mg/kg of pembrolizumab every 3 weeks in a double blind fashion.

Of the 540 patients, 61% were male, 43% were ≥ 65 years (median age was 62 years [range 15-89]) and 98% were white. Eighty-two percent had M1c stage, 73% had at least two and 32% of patients had three or more prior systemic therapies for advanced melanoma. Forty-five percent had an ECOG Performance Status of 1, 40% had elevated LDH and 23% had a BRAF mutated tumour.

The primary efficacy outcome measures were PFS as assessed by IRO using RECIST version 1.1 and OS. Secondary efficacy outcome measures were ORR and response duration. Table 4 summarises key efficacy measures in patients previously treated with ipilimumab, and the Kaplan-Meier curve for PFS is shown in Figure 3. Both pembrolizumab arms were superior to chemotherapy for PFS, and there was no difference between pembrolizumab doses. OS data were not mature at the time of the PFS analysis. There was no statistically significant difference between pembrolizumab and chemotherapy

in the preliminary OS analysis that was not adjusted for the potentially confounding effects of crossover. Of the patients randomised to the chemotherapy arm, 48% crossed over and subsequently received treatment with pembrolizumab.

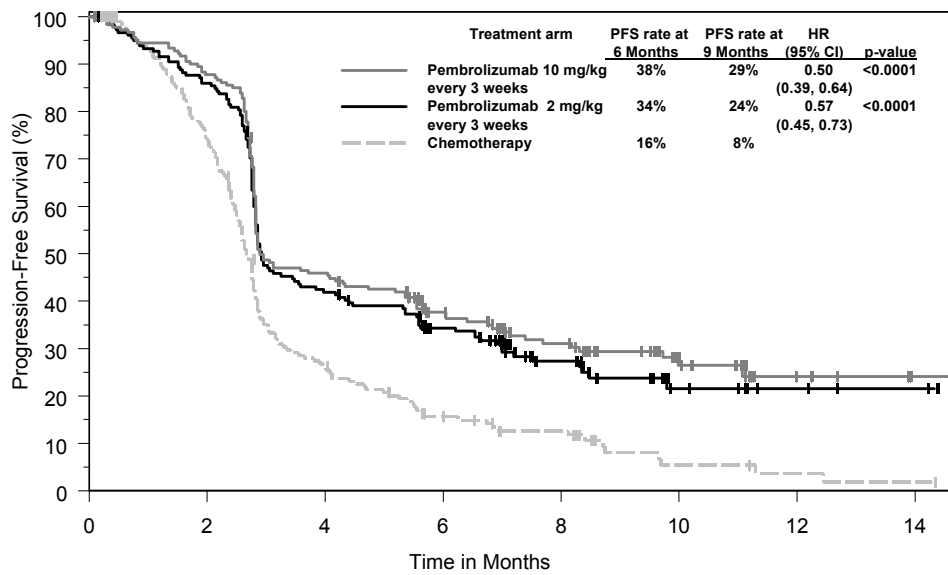
**Table 4: Response to pembrolizumab 2 mg/kg or 10 mg/kg every 3 weeks in patients with unresectable or metastatic melanoma in KEYNOTE-002**

<b>Endpoint</b>	<b>Pembrolizumab 2 mg/kg every 3 weeks n=180</b>	<b>Pembrolizumab 10 mg/kg every 3 weeks n=181</b>	<b>Chemotherapy  n=179</b>
<b>PFS</b>			
Number (%) of patients with event	129 (72%)	126 (70%)	155 (87%)
Hazard ratio* (95% CI)	0.57 (0.45, 0.73)	0.50 (0.39, 0.64)	---
p-Value <sup>†</sup>	< 0.0001	< 0.0001	---
Median in months (95% CI)	2.9 (2.8, 3.8)	2.9 (2.8, 4.7)	2.7 (2.5, 2.8)
<b>OS</b>			
Number (%) of patients with event	73 (41%)	69 (38%)	78 (44%)
Hazard ratio* (95% CI)	0.88 (0.64, 1.22)	0.78 (0.56, 1.08)	---
p-Value <sup>†</sup>	0.2294	0.0664	---
<b>Best overall response</b>			
ORR % (95% CI)	21% (15, 28)	25% (19, 32)	4% (2, 9)
Complete response %	2%	3%	0%
Partial response %	19%	23%	4%
<b>Response duration</b>			
Median in months (range)	Not reached (1.4+, 11.5+)	Not reached (1.2+, 11.1+)	8.5 (1.6+, 9.5)
% ongoing	87%	80%	63%

\* Hazard ratio (pembrolizumab compared to chemotherapy) based on the stratified Cox proportional hazard model

<sup>†</sup> Based on stratified Log rank test

**Figure 3: Kaplan-Meier curve for progression-free survival by treatment arm in KEYNOTE-002 (intent to treat population)**



Number at Risk	0	2	4	6	8	10	12	14
Pembrolizumab 10 mg/kg:	181	158	82	55	39	15	5	1
Pembrolizumab 2 mg/kg:	180	153	74	53	26	9	4	2
Chemotherapy:	179	128	43	22	15	4	2	1

***KEYNOTE-001: Open label study in melanoma patients naïve and previously treated with ipilimumab***

The safety and efficacy of pembrolizumab for patients with advanced melanoma were investigated in an uncontrolled, open-label study, KEYNOTE-001. Efficacy was evaluated for 276 patients from two defined cohorts, one which included patients previously treated with ipilimumab (and if BRAF V600 mutation-positive, with a BRAF or MEK inhibitor) and the other which included patients naïve to treatment with ipilimumab. Patients were randomly assigned to receive pembrolizumab at a dose of 2 mg/kg every 3 weeks or 10 mg/kg every 3 weeks. Patients were treated with pembrolizumab until disease progression or unacceptable toxicity. Clinically stable patients with initial evidence of disease progression were permitted to remain on treatment until disease progression was confirmed. Exclusion criteria were similar to those of KEYNOTE-002.

Of the 89 patients receiving 2 mg/kg of pembrolizumab who were previously treated with ipilimumab, 53% were male, 33% were  $\geq 65$  years of age and the median age was 59 years (range 18-88). All but two patients were white. Eighty-four percent had M1c stage and 8% of patients had a history of brain metastases. Seventy percent had at least two and 35% of patients had three or more prior systemic therapies for advanced melanoma. BRAF mutations were reported in 13% of the study population. All patients with BRAF mutant tumours were previously treated with a BRAF inhibitor.

Of the 51 patients receiving 2 mg/kg of pembrolizumab who were naïve to treatment with ipilimumab, 63% were male, 35% were  $\geq 65$  years of age and the median age was 60 years (range 35-80). All but one patient was white. Sixty-three percent had M1c stage and 2% of patients had a history of brain metastases. Forty-five percent had no prior therapies for advanced melanoma. BRAF mutations were reported in 20 (39%) patients. Among patients with BRAF mutant tumours, 10 (50%) were previously treated with a BRAF inhibitor.

The primary efficacy outcome measure was ORR as assessed by independent review using RECIST 1.1. Secondary efficacy outcome measures were disease control rate (DCR; including complete response, partial response and stable disease), response duration, PFS and OS. Tumour response was assessed at 12-week intervals. Table 5 summarises key efficacy measures in patients previously treated or naïve to treatment with ipilimumab, receiving pembrolizumab at the recommended dose.



**Table 5: Response to pembrolizumab 2 mg/kg every 3 weeks in patients with unresectable or metastatic melanoma in KEYNOTE-001**

Endpoint	Pembrolizumab 2 mg/kg every 3 weeks in patients previously treated with ipilimumab n=89	Pembrolizumab 2 mg/kg every 3 weeks in patients naïve to treatment with ipilimumab n=51
<b>Best Overall Response* by IRO<sup>†</sup></b>		
ORR %, (95% CI)	25% (16, 35)	33% (21, 48)
Complete response	3%	10%
Partial response	21%	24%
Disease Control Rate % <sup>‡</sup>	49%	49%
<b>Response Duration<sup>§</sup></b>		
Median in months (range)	Not reached (2.8+, 14.3+)	Not reached (1.6+, 13.8+)
% ongoing	86% <sup>¶</sup>	82% <sup>#</sup>
<b>PFS</b>		
Median in months (95% CI)	4.9 (2.8, 8.3)	5.5 (2.8, 14.0)
PFS rate at 6 months	43%	50%
<b>OS</b>		
Median in months (95% CI)	Not reached (11, not available)	Not reached (14, not available)
OS rate at 12 months	60%	72%

\* Includes patients without measurable disease at baseline by independent radiology

<sup>†</sup> IRO = Integrated radiology and oncologist assessment using RECIST 1.1

<sup>‡</sup> Based on best response of stable disease or better

<sup>§</sup> Based on patients with a confirmed response by independent review, starting from the date the response was first recorded; n=22 for patients previously treated with ipilimumab; n=17 for patients naïve to treatment with ipilimumab

<sup>¶</sup> Responders were followed for a minimum of 12 months after initiation of therapy

<sup>#</sup> Responders were followed for a minimum of 15 months after initiation of therapy

Results for patients previously treated with ipilimumab (n=84) and naïve to treatment with ipilimumab (n=52) who received 10 mg/kg of pembrolizumab every 3 weeks were similar to those seen in patients who received 2 mg/kg of pembrolizumab every 3 weeks.

#### *Sub-population analyses*

##### BRAF mutation status in melanoma

A subgroup analysis of KEYNOTE-002 in patients who were BRAF wild type (n=415; 77%) or BRAF mutant with prior BRAF treatment (n=125; 23%) was performed. The PFS HRs (pooled pembrolizumab [2 mg/kg or 10 mg/kg every 3 weeks] vs. chemotherapy) were 0.51 (95% CI: 0.41, 0.65) for BRAF wild type and 0.56 (95% CI: 0.37, 0.85) for BRAF mutant with prior BRAF treatment. The PFS HRs for pembrolizumab 2 mg/kg every 3 weeks vs. chemotherapy were 0.51 (95% CI: 0.39, 0.67) for BRAF wild type and 0.74 (95% CI: 0.46, 1.18) for BRAF mutant with prior BRAF treatment. The OS HRs for pooled pembrolizumab vs. chemotherapy were 0.83 (95% CI: 0.60, 1.15) for BRAF wild type and 0.82 (95% CI: 0.47, 1.43) for BRAF mutant with prior BRAF treatment. The OS HRs for pembrolizumab 2 mg/kg every 3 weeks vs. chemotherapy were 0.80 (95% CI: 0.55, 1.18) for BRAF wild type and 1.03 (95% CI: 0.55, 1.91) for BRAF mutant with prior BRAF treatment. ORR for pooled pembrolizumab and pembrolizumab 2 mg/kg every 3 weeks vs. chemotherapy was 27% and 25% vs. 6% for BRAF wild type and 12% and 9% vs. 0% for BRAF mutant with prior BRAF treatment.

A subgroup analysis of KEYNOTE-006 in patients who were BRAF wild type (n=525; 63%), BRAF mutant without prior BRAF treatment (n=163; 20%) and BRAF mutant with prior BRAF treatment (n=139; 17%) was performed. The PFS HRs (pooled pembrolizumab [10 mg/kg every 2 or 3 weeks]

vs. ipilimumab) were 0.57 (95% CI: 0.45, 0.73) for BRAF wild type, 0.50 (95% CI: 0.32, 0.77) for BRAF mutant without prior BRAF treatment, and 0.73 (95% CI: 0.48, 1.11) for BRAF mutant with prior BRAF treatment. The OS HRs for pooled pembrolizumab vs. ipilimumab were 0.61 (95% CI: 0.46, 0.82) for BRAF wild type, 0.69 (95% CI: 0.33, 1.45) for BRAF mutant without prior BRAF treatment, and 0.75 (95% CI: 0.45, 1.26) for BRAF mutant with prior BRAF treatment. ORR for pooled pembrolizumab vs. ipilimumab was 34% vs. 13% for BRAF wild type, 41% vs. 13% for BRAF mutant without prior BRAF treatment, and 21% vs. 6% for BRAF mutant with prior BRAF treatment.

#### PD-L1 status in melanoma

A subgroup analysis of KEYNOTE-002 in patients who were PD-L1 positive (Allred proportion score of  $\geq 2$  representing PD-L1 membrane expression in  $\geq 1\%$  of tumour cells) vs. PD-L1 negative (Allred proportion score of 0 or 1) was performed. PD-L1 expression was tested retrospectively by immunohistochemistry research assay with the 22C3 anti-PD-L1 antibody. Among patients who were evaluable for PD-L1 expression (78%), 69% (n=291) were PD-L1 positive and 31% (n=130) were PD-L1 negative. The PFS HRs (pooled pembrolizumab [2 mg/kg or 10 mg/kg every 3 weeks] vs. chemotherapy) were 0.52 (95% CI: 0.39, 0.68) for PD-L1 positive patients and 0.60 (95% CI: 0.38, 0.94) for PD-L1 negative patients. The PFS HRs for pembrolizumab 2 mg/kg every 3 weeks vs. chemotherapy were 0.54 (95% CI: 0.39, 0.75) for PD-L1 positive patients and 0.89 (95% CI: 0.53, 1.50) for PD-L1 negative patients. The OS HRs for pooled pembrolizumab vs. chemotherapy were 0.82 (95% CI: 0.55, 1.23) for PD-L1 positive patients and 0.77 (95% CI: 0.43, 1.37) for PD-L1 negative patients. The OS HRs for pembrolizumab 2 mg/kg every 3 weeks vs. chemotherapy were 0.93 (95% CI: 0.58, 1.49) for PD-L1 positive patients and 1.19 (95% CI: 0.58, 2.46) for PD-L1 negative patients. ORR for pooled pembrolizumab and pembrolizumab 2 mg/kg every 3 weeks vs. chemotherapy was 26% and 23% vs. 4% for PD-L1 positive patients and 15% and 11% vs. 8% for PD-L1 negative patients.

A subgroup analysis of KEYNOTE-006 in patients who were PD-L1 positive (n=671; 80%) vs. PD-L1 negative (n=150; 18%) was performed. Among patients who were evaluable for PD-L1 expression (98%), 82% were PD-L1 positive and 18% were PD-L1 negative. The PFS HRs (pooled pembrolizumab [10 mg/kg every 2 or 3 weeks] vs. ipilimumab) were 0.53 (95% CI: 0.43, 0.65) for PD-L1 positive patients and 0.73 (95% CI: 0.47, 1.11) for PD-L1 negative patients. The OS HRs for pooled pembrolizumab vs. ipilimumab were 0.56 (95% CI: 0.43, 0.73) for PD-L1 positive patients and 0.95 (95% CI: 0.56, 1.62) for PD-L1 negative patients. The ORRs for the pooled pembrolizumab vs. ipilimumab group were 37% vs. 12% for PD-L1 positive patients and 18% vs. 11% for PD-L1 negative patients.

#### Ocular melanoma

In 20 subjects with ocular melanoma included in KEYNOTE-001, no objective responses were reported; stable disease was reported in 6 patients.

#### NSCLC

##### KEYNOTE-024: Controlled trial of NSCLC patients naive to treatment

The safety and efficacy of pembrolizumab were investigated in KEYNOTE-024, a multicentre, controlled study for the treatment of previously untreated metastatic NSCLC. Patients had PD-L1 expression with a  $\geq 50\%$  tumour proportion score (TPS) based on the PD-L1 IHC 22C3 pharmDx™ Kit. Patients were randomised (1:1) to receive pembrolizumab at a dose of 200 mg every 3 weeks (n=154) or investigator's choice platinum-containing chemotherapy (n=151; including pemetrexed+carboplatin, pemetrexed+cisplatin, gemcitabine+cisplatin, gemcitabine+carboplatin, or paclitaxel+carboplatin. Non-squamous patients could receive pemetrexed maintenance). Patients were treated with pembrolizumab until unacceptable toxicity or disease progression. Treatment could continue beyond disease progression if the patient was clinically stable and was considered to be deriving clinical benefit by the investigator. Patients without disease progression could be treated for up to 24 months. The study excluded patients with EGFR or ALK genomic tumour aberrations; autoimmune disease that required systemic therapy within 2 years of treatment; a medical condition

that required immunosuppression; or who had received more than 30 Gy of thoracic radiation within the prior 26 weeks. Assessment of tumour status was performed every 9 weeks. Patients on chemotherapy who experienced independently-verified progression of disease were able to crossover and receive pembrolizumab.

Among the 305 patients in KEYNOTE-024, baseline characteristics were: median age 65 years (54% age 65 or older); 61% male; 82% White, 15% Asian; and ECOG performance status 0 and 1 in 35% and 65%, respectively. Disease characteristics were squamous (18%) and non-squamous (82%); M1 (99%); and brain metastases (9%).

The primary efficacy outcome measure was PFS as assessed by BICR using RECIST 1.1. Secondary efficacy outcome measures were OS and ORR (as assessed by BICR using RECIST 1.1). Table 6 summarizes key efficacy measures for the entire ITT population.

**Table 6: Efficacy Results in KEYNOTE-024**

<b>Endpoint</b>	<b>Pembrolizumab 200 mg every 3 weeks n=154</b>	<b>Chemotherapy  n=151</b>
<b>PFS</b>		
Number (%) of patients with event	73 (47%)	116 (77%)
Hazard ratio* (95% CI)	0.50 (0.37, 0.68)	
p-Value <sup>†</sup>	<0.001	
Median in months (95% CI)	10.3 (6.7, NA)	6.0 (4.2, 6.2)
<b>OS</b>		
Number (%) of patients with event	44 (29%)	64 (42%)
Hazard ratio* (95% CI)	0.60 (0.41, 0.89)	
p-Value <sup>†</sup>	0.005	
Median in months (95% CI)	Not reached (NA, NA)	Not reached (9.4, NA)
<b>Objective response rate</b>		
ORR % (95% CI)	45% (37, 53)	28% (21, 36)
Complete response %	4%	1%
Partial response %	41%	27%
<b>Response Duration<sup>‡</sup></b>		
Median in months (range)	Not reached (1.9+, 14.5+)	6.3 (2.1+, 12.6+)
% with duration ≥ 6 months	88% <sup>§</sup>	59% <sup>¶</sup>

\* Hazard ratio (pembrolizumab compared to chemotherapy) based on the stratified Cox proportional hazard model

<sup>†</sup> Based on stratified Log rank test

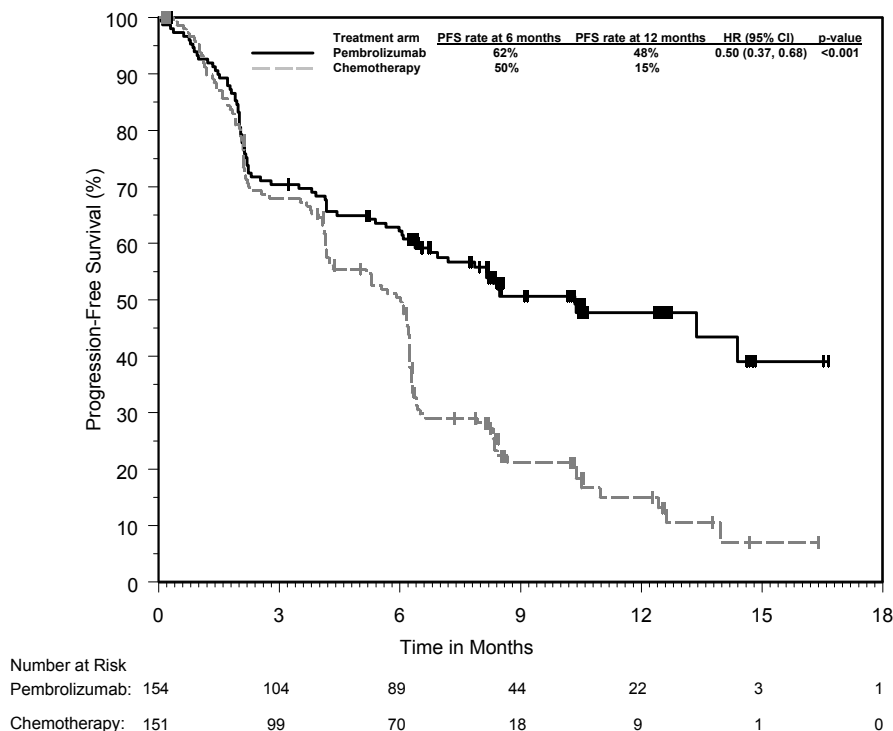
<sup>‡</sup> Based on patients with a best overall response as confirmed complete or partial response

<sup>§</sup> Based on Kaplan-Meier estimates; includes 43 patients with responses of 6 months or longer

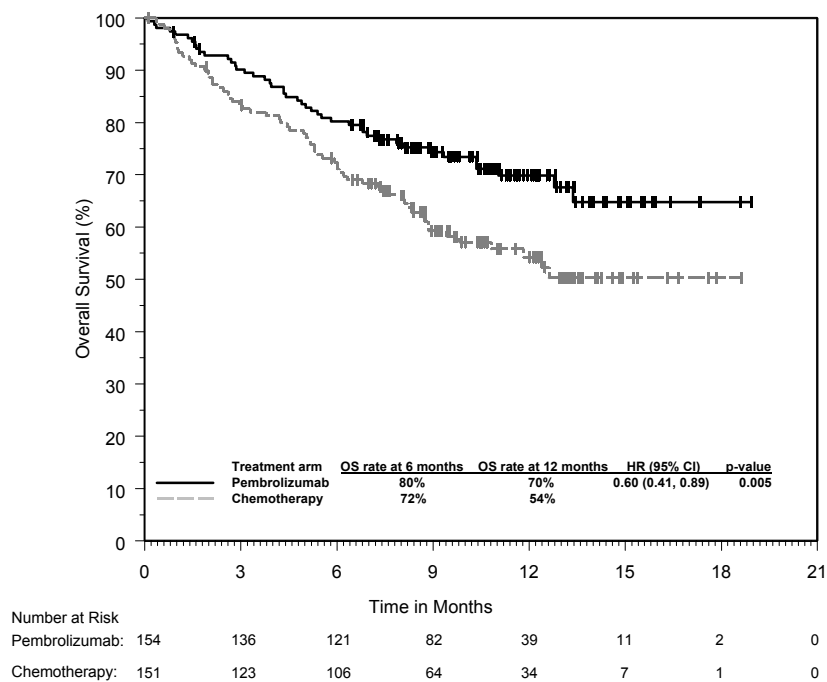
<sup>¶</sup> Based on Kaplan-Meier estimates; includes 16 patients with responses of 6 months or longer

NA = not available

**Figure 4: Kaplan-Meier Curve for Progression-Free Survival by Treatment Arm in KEYNOTE-024 (Intent to Treat Population)**



**Figure 5: Kaplan-Meier Curve for Overall Survival by Treatment Arm in KEYNOTE-024 (Intent to Treat Population)**



In a subgroup analysis, a reduced survival benefit of pembrolizumab compared to chemotherapy was observed in the small number of patients who were never-smokers; however, due to the small number of patients, no definitive conclusions can be drawn from these data.

KEYNOTE-010: Controlled trial of NSCLC patients previously treated with chemotherapy

The safety and efficacy of pembrolizumab were investigated in KEYNOTE-010, a multicentre, open-label, controlled study for the treatment of advanced NSCLC in patients previously treated with platinum-containing chemotherapy. Patients had PD-L1 expression with a  $\geq 1\%$  TPS based on the PD-L1 IHC 22C3 pharmDx™ Kit. Patients with EGFR activation mutation or ALK translocation also had disease progression on approved therapy for these mutations prior to receiving pembrolizumab. Patients were randomised (1:1:1) to receive pembrolizumab at a dose of 2 (n=344) or 10 mg/kg (n=346) every 3 weeks or docetaxel at a dose of 75 mg/m<sup>2</sup> every 3 weeks (n=343) until disease progression or unacceptable toxicity. The trial excluded patients with autoimmune disease; a medical condition that required immunosuppression; or who had received more than 30 Gy of thoracic radiation within the prior 26 weeks. Assessment of tumour status was performed every 9 weeks. The baseline characteristics for this population included: median age 63 years (42% age 65 or older); 61% male; 72% White and 21% Asian and 34% and 66% with an ECOG performance status 0 and 1, respectively. Disease characteristics were squamous (21%) and non-squamous (70%); M1 (91%); stable brain metastases (15%) and the incidence of mutations was EGFR (8%) or ALK (1%). Prior therapy included platinum-doublet regimen (100%); patients received one (69%) or two or more (29%) treatment lines.

The primary efficacy outcome measures were OS and PFS as assessed by blinded independent central review (BICR) using RECIST 1.1. Secondary efficacy outcome measures were ORR and response duration. Table 7 summarises key efficacy measures for the entire population (TPS  $\geq 1\%$ ) and for the patients with TPS  $\geq 50\%$  and the Kaplan-Meier curve for OS (TPS  $\geq 1\%$ ) is shown in Figure 6.

**Table 7: Response to pembrolizumab 2 or 10 mg/kg every 3 weeks in previously treated patients with NSCLC in KEYNOTE-010**

Endpoint	Pembrolizumab 2 mg/kg every 3 weeks	Pembrolizumab 10 mg/kg every 3 weeks	Docetaxel 75 mg/m <sup>2</sup> every 3 weeks
<b>TPS ≥ 1%</b>			
Number of patients	344	346	343
<b>OS</b>			
Number (%) of patients with event	172 (50%)	156 (45%)	193 (56%)
Hazard ratio* (95% CI)	0.71 (0.58, 0.88)	0.61 (0.49, 0.75)	---
p-Value <sup>†</sup>	< 0.001 <sup>‡</sup>	< 0.001 <sup>‡</sup>	---
Median in months (95% CI)	10.4 (9.4, 11.9)	12.7 (10.0, 17.3)	8.5 (7.5, 9.8)
<b>PFS<sup>§</sup></b>			
Number (%) of patients with event	266 (77%)	255 (74%)	257 (75%)
Hazard ratio* (95% CI)	0.88 (0.73, 1.04)	0.79 (0.66, 0.94)	---
p-Value <sup>†</sup>	0.068	0.005	---
Median in months (95% CI)	3.9 (3.1, 4.1)	4.0 (2.6, 4.3)	4.0 (3.1, 4.2)
<b>Overall response rate<sup>§</sup></b>			
ORR % <sup>¶</sup> (95% CI)	18% (14, 23)	18% (15, 23)	9% (7, 13)
<b>Response duration<sup>§, #, P</sup></b>			
Median in months (range)	Not reached (0.7+, 20.1+)	Not reached (2.1+, 17.8+)	6.2 (1.4+, 8.8+)
% ongoing	73%	72%	34%
<b>TPS ≥ 50%</b>			
Number of patients	139	151	152
<b>OS</b>			
Number (%) of patients with event	58 (42%)	60 (40%)	86 (57%)
Hazard ratio* (95% CI)	0.54 (0.38, 0.77)	0.50 (0.36, 0.70)	---
p-Value <sup>†</sup>	< 0.001 <sup>‡</sup>	< 0.001 <sup>‡</sup>	---
Median in months (95% CI)	14.9 (10.4, NA)	17.3 (11.8, NA)	8.2 (6.4, 10.7)
<b>PFS<sup>§</sup></b>			
Number (%) of patients with event	89 (64%)	97 (64%)	118 (78%)
Hazard ratio* (95% CI)	0.58 (0.43, 0.77)	0.59 (0.45, 0.78)	---
p-Value <sup>†</sup>	< 0.001 <sup>‡</sup>	< 0.001 <sup>‡</sup>	---
Median in months (95% CI)	5.2 (4.0, 6.5)	5.2 (4.1, 8.1)	4.1 (3.6, 4.3)
<b>Overall response rate<sup>§</sup></b>			
ORR % <sup>¶</sup> (95% CI)	30% (23, 39)	29% (22, 37)	8% (4, 13)
<b>Response duration<sup>§, #, P</sup></b>			
Median in months (range)	Not reached (0.7+, 16.8+)	Not reached (2.1+, 17.8+)	8.1 (2.1+, 8.8+)
% ongoing	76%	75%	33%

\* Hazard ratio (pembrolizumab compared to docetaxel) based on the stratified Cox proportional hazard model

<sup>†</sup> Based on stratified Log rank test

<sup>‡</sup> Statistically significant based on a pre-specified  $\alpha$  level adjusted for multiplicity

<sup>§</sup> Assessed by blinded independent central review (BICR) using RECIST 1.1

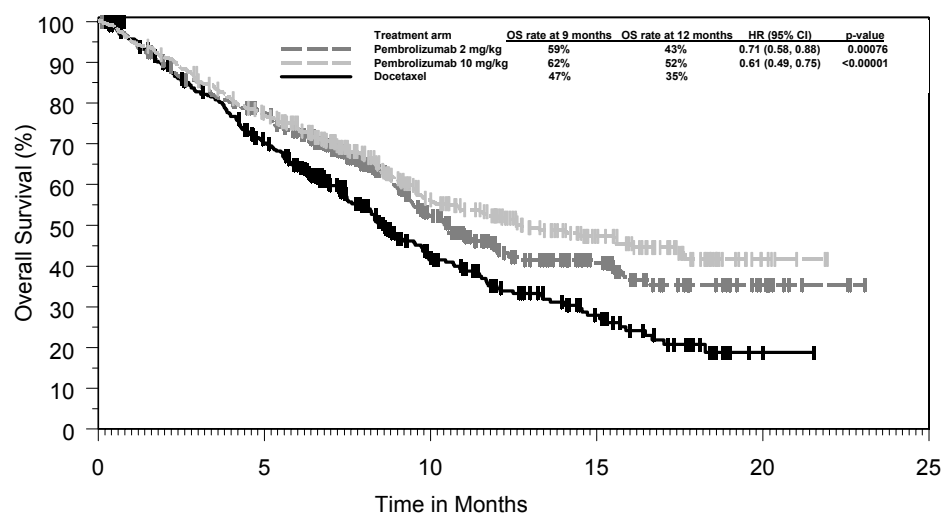
<sup>¶</sup> All responses were partial responses

<sup>#</sup> Based on patients with a best overall response as confirmed complete or partial response

<sup>P</sup> Includes 30, 31 and 2 patients with ongoing responses of 6 months or longer in the pembrolizumab 2 mg/kg, pembrolizumab 10 mg/kg and docetaxel arms respectively

<sup>15</sup> Includes 22, 24 and 1 patients with ongoing responses of 6 months or longer in the pembrolizumab 2 mg/kg, pembrolizumab 10 mg/kg and docetaxel arms respectively

**Figure 6: Kaplan-Meier curve for overall survival by treatment arm in KEYNOTE-010 (patients with PD-L1 expression tumour proportion score  $\geq$  1%, intent to treat population)**



Number at Risk					
Pembrolizumab 2 mg/kg:	344	259	115	49	12
Pembrolizumab 10 mg/kg:	346	255	124	56	6
Docetaxel:	343	212	79	33	1

Efficacy results were similar for the 2 mg/kg and 10 mg/kg pembrolizumab arms. Efficacy results for OS were consistent regardless of the age of tumour specimen (new vs. archival) based on an intergroup comparison.

In subgroup analyses, a reduced survival benefit of pembrolizumab compared to docetaxel was observed for patients who were never-smokers or patients with tumours harbouring EGFR activating mutations who received at least platinum-based chemotherapy and a tyrosine kinase inhibitor; however, due to the small numbers of patients, no definitive conclusions can be drawn from these data.

The efficacy and safety of pembrolizumab in patients with tumours that do not express PD-L1 have not been established.

### Classical Hodgkin lymphoma

#### KEYNOTE-087 and KEYNOTE-013: Open-label studies in patients with refractory or relapsed classical Hodgkin lymphoma (cHL)

The efficacy of pembrolizumab was investigated in KEYNOTE-087 and KEYNOTE-013, two multicentre, open-label studies for the treatment of 241 patients with cHL. These studies enrolled patients who failed ASCT and BV, who were ineligible for ASCT because they were unable to achieve a complete or partial remission to salvage chemotherapy and failed BV, or who failed ASCT and did not receive BV. Five study subjects were ineligible to ASCT due to reasons other than failure to salvage chemotherapy. Both studies included patients regardless of PD-L1 expression. Patients with active, non-infectious pneumonitis, an allogeneic transplant within the past 5 years (or > 5 years but with GVHD), active autoimmune disease or a medical condition that required immunosuppression were ineligible for either trial. Patients received pembrolizumab 200 mg every 3 weeks (n=210; KEYNOTE-087) or 10 mg/kg every 2 weeks (n=31; KEYNOTE-013) until unacceptable toxicity or documented disease progression.

Among KEYNOTE-087 patients, the baseline characteristics were median age 35 years (9% age 65 or older); 54% male; 88% White; and 49% and 51% had an ECOG performance status 0 and 1, respectively. The median number of prior lines of therapy administered for the treatment of cHL was 4 (range 1 to 12). Eighty-one percent were refractory to at least one prior therapy, including 35% who were refractory to first line therapy. Sixty-one percent of patients had received Auto-SCT, 38% were transplant ineligible; 17% had no prior brentuximab use; and 36% of patients had prior radiation therapy. Disease subtypes were 80% nodular sclerosis, 11% mixed cellularity, 4% lymphocyte-rich and 2% lymphocyte-depleted.

Among KEYNOTE-013 patients, the baseline characteristics were median age 32 years (7% age 65 or older), 58% male, 94% White; and 45% and 55% had an ECOG performance status 0 and 1, respectively. The median number of prior lines of therapy administered for the treatment of cHL was 5 (range 2 to 15). Eighty-seven percent were refractory to at least one prior therapy, including 39% who were refractory to first line therapy. Seventy-four percent of patients had received Auto-SCT, 26% were transplant ineligible, and 42% of patients had prior radiation therapy. Disease subtypes were 97% nodular sclerosis and 3% mixed cellularity.

The major efficacy outcome measures (ORR and CRR) were assessed by blinded independent central review according to the 2007 revised International Working Group (IWG) criteria. Secondary efficacy outcome measures were duration of response, PFS and OS. Response was assessed in KN087 and KN013 every 12 and 8 weeks, respectively, with the first planned post-baseline assessment at week 12. Efficacy results are summarized in Table 8.



**Table 8: Efficacy results in KEYNOTE-087 and KEYNOTE-013**

Endpoint	KEYNOTE-087 <sup>a</sup>	KEYNOTE-013 <sup>b</sup>
	Pembrolizumab 200 mg every 3 weeks n=210	Pembrolizumab 10 mg/kg every 2 weeks n=31
<b>Objective response rate<sup>c</sup></b>		
ORR % (95% CI)	69% (62.3, 75.2)	58% (39.1, 75.5)
Complete Remission	22%	19%
Partial Remission	47%	39%
<b>Response duration<sup>c</sup></b>		
Median in months (range)	11.1 (0.0+, 11.1) <sup>d</sup>	Not reached (0.0+, 26.1+) <sup>e</sup>
% with duration ≥ 6-months	76% <sup>f</sup>	80% <sup>g</sup>
% with duration ≥ 12-months	---	70% <sup>h</sup>
<b>Time to response</b>		
Median in months (range)	2.8 (2.1, 8.8) <sup>d</sup>	2.8 (2.4, 8.6) <sup>e</sup>
<b>PFS<sup>c</sup></b>		
Number (%) of patients with event	70 (33%)	18 (58%)
Median in months (95% CI)	11.3 (10.8, Not reached)	11.4 (4.9, 27.8)
6-month PFS rate	72%	66%
9-month PFS rate	62%	---
12-month PFS rate	---	48%
<b>OS</b>		
Number (%) of patients with event	4 (2%)	4 (13%)
6-month OS rate	99.5%	100%
12-month OS rate	97.6%	87.1%

<sup>a</sup> Median follow-up time of 10.1 months

<sup>b</sup> Median follow-up time of 28.7 months

<sup>c</sup> Assessed by blinded independent central review according to the 2007 revised International Working Group (IWG) criteria by PET CT scans

<sup>d</sup> Based on patients (n=145) with a response by independent review

<sup>e</sup> Based on patients (n=18) with a response by independent review

<sup>f</sup> Based on Kaplan-Meier estimation; includes 31 patients with responses of 6 months or longer

<sup>g</sup> Based on Kaplan-Meier estimation; includes 9 patients with responses of 6 months or longer

<sup>h</sup> Based on Kaplan-Meier estimation; includes 7 patients with responses of 12 months or longer

### Safety and efficacy in elderly patients

Overall, 20 cHL patients ≥ 65 years were treated with pembrolizumab in studies KEYNOTE-087 and KEYNOTE-013. Data from these patients are too limited to draw any conclusion on safety or efficacy in this population.

### Paediatric population

The European Medicines Agency has deferred the obligation to submit the results of studies with pembrolizumab in one or more subsets of the paediatric population in treatment of all conditions included in the category of malignant neoplasms (except nervous system, haematopoietic and lymphoid tissue) (see section 4.2 for information on paediatric use).

## **5.2 Pharmacokinetic properties**

The pharmacokinetics of pembrolizumab was studied in 2,993 patients with metastatic or unresectable melanoma, NSCLC, or carcinoma who received doses in the range of 1 to 10 mg/kg every 2 or 3 weeks.

### Absorption

Pembrolizumab is dosed via the intravenous route and therefore is immediately and completely bioavailable.

### Distribution

Consistent with a limited extravascular distribution, the volume of distribution of pembrolizumab at steady state is small (~7.5 L; CV: 20%). As expected for an antibody, pembrolizumab does not bind to plasma proteins in a specific manner.

### Biotransformation

Pembrolizumab is catabolised through non-specific pathways; metabolism does not contribute to its clearance.

### Elimination

The systemic clearance of pembrolizumab is ~0.2 L/day (CV: 37%) and the terminal half-life ( $t_{1/2}$ ) is ~25 days (CV: 38%).

### Linearity/non-linearity

Exposure to pembrolizumab as expressed by peak concentration ( $C_{max}$ ) or area under the plasma concentration time curve (AUC) increased dose proportionally within the dose range for efficacy. Upon repeated dosing, the clearance of pembrolizumab was found to be independent of time, and systemic accumulation was approximately 2.1-fold when administered every 3 weeks. Near steady-state concentrations of pembrolizumab were achieved by 18 weeks; the median steady-state trough concentrations ( $C_{min}$ ) at 18 weeks were approximately 21 mcg/mL at a dose of 2 mg/kg every 3 weeks and 28 mcg/mL at a dose of 200 mg every 3 weeks. The median area under the concentration time curve at steady state over 3 weeks ( $AUC_{0-3weeks}$ ) was 658 mcg·day/mL at a dose of 2 mg/kg every 3 weeks and 876 mcg·day/mL at a dose of 200 mg every 3 weeks.

Following administration of pembrolizumab 200 mg every 3 weeks in patients with cHL, the observed median  $C_{min}$  at steady-state was up to 40% higher than that in other tumour types treated with the same dosage; however, the range of trough concentrations is similar. There are no notable differences in median  $C_{max}$  between cHL and other tumour types. Based on available safety data in cHL and other tumour types, these differences are not clinically meaningful.

### Special populations

The effects of various covariates on the pharmacokinetics of pembrolizumab were assessed in population pharmacokinetic analyses. The following factors had no clinically important effect on the clearance of pembrolizumab: age (range 15-94 years), gender, race, mild or moderate renal impairment, mild hepatic impairment and tumour burden. The relationship between body weight and clearance supports the use of either fixed dose or body weight-based dosing to provide adequate and similar control of exposure.

### Renal impairment

The effect of renal impairment on the clearance of pembrolizumab was evaluated by population pharmacokinetic analyses in patients with mild or moderate renal impairment compared to patients with normal renal function. No clinically important differences in the clearance of pembrolizumab were found between patients with mild or moderate renal impairment and patients with normal renal function. Pembrolizumab has not been studied in patients with severe renal impairment.

### Hepatic impairment

The effect of hepatic impairment on the clearance of pembrolizumab was evaluated by population pharmacokinetic analyses in patients with mild hepatic impairment (as defined using the US National Cancer Institute criteria of hepatic dysfunction) compared to patients with normal hepatic function. No clinically important differences in the clearance of pembrolizumab were found between patients

with mild hepatic impairment and normal hepatic function. Pembrolizumab has not been studied in patients with moderate or severe hepatic impairment (see section 4.2).

### **5.3 Preclinical safety data**

The safety of pembrolizumab was evaluated in a 1-month and a 6-month repeat-dose toxicity study in Cynomolgus monkeys administered intravenous doses of 6, 40 or 200 mg/kg once a week in the 1-month study and once every two weeks in the 6-month study, followed by a 4-month treatment-free period. No findings of toxicological significance were observed and the no observed adverse effect level (NOAEL) in both studies was  $\geq 200$  mg/kg, which is 19 times the exposure in humans at the highest clinically tested dose (10 mg/kg).

Animal reproduction studies have not been conducted with pembrolizumab. The PD-1/PD-L1 pathway is thought to be involved in maintaining tolerance to the foetus throughout pregnancy. Blockade of PD-L1 signaling has been shown in murine models of pregnancy to disrupt tolerance to the foetus and to result in an increase in foetal loss.

Animal fertility studies have not been conducted with pembrolizumab. In 1 month and 6 month repeat-dose toxicology studies in monkeys, there were no notable effects in the male and female reproductive organs; however, many animals in these studies were not sexually mature.

## **6. PHARMACEUTICAL PARTICULARS**

### **6.1 List of excipients**

L-histidine  
L-histidine hydrochloride monohydrate  
Sucrose  
Polysorbate 80

### **6.2 Incompatibilities**

In the absence of compatibility studies, this medicinal product must not be mixed with other medicinal products except those mentioned in section 6.6.

### **6.3 Shelf life**

Unopened vial  
2 years.

#### After reconstitution

From a microbiological point of view, the reconstituted or diluted solution should be used immediately. The reconstituted or diluted solution must not be frozen. If not used immediately, chemical and physical in-use stability of KEYTRUDA has been demonstrated for 24 hours at 2°C to 8°C. This 24 hour total hold from reconstitution may include up to 6 hours at room temperature (at or below 25°C). If refrigerated, the vials and/or intravenous bags must be allowed to come to room temperature prior to use.

### **6.4 Special precautions for storage**

Store in a refrigerator (2°C – 8°C).

For storage conditions after reconstitution or dilution of the medicinal product, see section 6.3.

## 6.5 Nature and contents of container

15 mL Type I glass vial, with a grey bromobutyl stopper and an aluminium seal with an avocado coloured flip-off cap, containing 50 mg pembrolizumab.

Each carton contains one vial.

## 6.6 Special precautions for disposal and other handling

### Preparation and administration

- Prior to reconstitution, the vial of lyophilised powder can be out of refrigeration (temperatures at or below 25°C) for up to 24 hours.
- Aseptically add 2.3 mL of water for injections to yield a 25 mg/mL (pH 5.2-5.8) solution of KEYTRUDA. Each vial contains an excess fill of 10 mg (0.4 mL) to ensure the recovery of 50 mg of KEYTRUDA per vial. After reconstitution, 1 mL of concentrate contains 25 mg of pembrolizumab.
- To avoid foaming, deliver the water along the walls of the vial and not directly on the lyophilised powder.
- Slowly swirl the vial to allow reconstitution of the lyophilised powder. Allow up to 5 minutes for the bubbles to clear. Do not shake the vial.
- Parenteral medicinal products should be inspected visually for particulate matter and discolouration prior to administration. Reconstituted KEYTRUDA is a clear to slightly opalescent, colourless to slightly yellow solution. Discard the vial if visible particles are observed.
- Withdraw the required volume up to 2 mL (50 mg) of KEYTRUDA and transfer into an intravenous bag containing sodium chloride 9 mg/mL (0.9%) or glucose 50 mg/mL (5%) to prepare a diluted solution with a final concentration ranging from 1 to 10 mg/mL. Mix diluted solution by gentle inversion.
- From a microbiological point of view, the reconstituted or diluted solution should be used immediately. The reconstituted or diluted solution must not be frozen. If not used immediately, chemical and physical in-use stability of KEYTRUDA has been demonstrated for 24 hours at 2°C to 8°C. This 24 hour total hold from reconstitution may include up to 6 hours at room temperature (at or below 25°C). If refrigerated, the vials and/or intravenous bags must be allowed to come to room temperature prior to use. Administer the infusion solution intravenously over 30 minutes using a sterile, non-pyrogenic, low-protein binding 0.2 to 5 µm in-line or add-on filter.
- Do not co-administer other medicinal products through the same infusion line.
- KEYTRUDA is for single use only. Discard any unused portion left in the vial.

Any unused medicinal product or waste material should be disposed of in accordance with local requirements.

## 7. MARKETING AUTHORISATION HOLDER

Merck Sharp & Dohme Limited  
Hertford Road  
Hoddesdon  
Hertfordshire EN11 9BU  
United Kingdom

**8. MARKETING AUTHORISATION NUMBER(S)**

EU/1/15/1024/001

**9. DATE OF FIRST AUTHORISATION/RENEWAL OF THE AUTHORISATION**

Date of first authorisation: 17 July 2015

**10. DATE OF REVISION OF THE TEXT**

Detailed information on this medicinal product is available on the website of the European Medicines Agency <http://www.ema.europa.eu>.

▼ This medicinal product is subject to additional monitoring. This will allow quick identification of new safety information. Healthcare professionals are asked to report any suspected adverse reactions. See section 4.8 for how to report adverse reactions.

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

KEYTRUDA 25 mg/mL concentrate for solution for infusion.

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

One vial of 4 mL of concentrate contains 100 mg of pembrolizumab.

Each mL of concentrate contains 25 mg of pembrolizumab.

Pembrolizumab is a humanised monoclonal anti-programmed cell death-1 (PD-1) antibody (IgG4/kappa isotype with a stabilising sequence alteration in the Fc region) produced in Chinese hamster ovary cells by recombinant DNA technology.

For the full list of excipients, see section 6.1.

## **3. PHARMACEUTICAL FORM**

Concentrate for solution for infusion.

Clear to slightly opalescent, colourless to slightly yellow solution, pH 5.2 – 5.8.

## **4. CLINICAL PARTICULARS**

### **4.1 Therapeutic indications**

KEYTRUDA as monotherapy is indicated for the treatment of advanced (unresectable or metastatic) melanoma in adults.

KEYTRUDA as monotherapy is indicated for the first-line treatment of metastatic non-small cell lung carcinoma (NSCLC) in adults whose tumours express PD-L1 with a  $\geq 50\%$  tumour proportion score (TPS) with no EGFR or ALK positive tumour mutations.

KEYTRUDA as monotherapy is indicated for the treatment of locally advanced or metastatic NSCLC in adults whose tumours express PD-L1 with a  $\geq 1\%$  TPS and who have received at least one prior chemotherapy regimen. Patients with EGFR or ALK positive tumour mutations should also have received targeted therapy before receiving KEYTRUDA.

KEYTRUDA as monotherapy is indicated for the treatment of adult patients with relapsed or refractory classical Hodgkin lymphoma (cHL) who have failed autologous stem cell transplant (ASCT) and brentuximab vedotin (BV), or who are transplant-ineligible and have failed BV.

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

Treatment must be initiated and supervised by specialist physicians experienced in the treatment of cancer.

### PD-L1 testing for patients with NSCLC

Patients with NSCLC should be selected for treatment based on the tumour expression of PD-L1 confirmed by a validated test (see section 5.1).

### Posology

KEYTRUDA should be administered as an intravenous infusion over 30 minutes every 3 weeks.

The recommended dose of KEYTRUDA is:

- 200 mg for NSCLC that has not been previously treated with chemotherapy or for cHL.
- 2 mg/kg for NSCLC that has been previously treated with chemotherapy or for melanoma.

Patients should be treated with KEYTRUDA until disease progression or unacceptable toxicity. Atypical responses (i.e., an initial transient increase in tumour size or small new lesions within the first few months followed by tumour shrinkage) have been observed. It is recommended to continue treatment for clinically stable patients with initial evidence of disease progression until disease progression is confirmed.

*Dose delay or discontinuation (see also section 4.4)*

**Table 1: Recommended treatment modifications for KEYTRUDA**

<b>Immune-related adverse reactions</b>	<b>Severity</b>	<b>Treatment modification</b>
Pneumonitis	Grade 2	Withhold*
	Grade 3 or 4, or recurrent Grade 2	Permanently discontinue
Colitis	Grade 2 or 3	Withhold*
	Grade 4	Permanently discontinue
Nephritis	Grade 2 with creatinine > 1.5 to ≤ 3 times upper limit of normal (ULN)	Withhold*
	Grade ≥ 3 with creatinine > 3 times ULN	Permanently discontinue
Endocrinopathies	Symptomatic hypophysitis Type 1 diabetes associated with Grade > 3 hyperglycaemia (glucose > 250 mg/dL or > 13.9 mmol/L) or associated with ketoacidosis Hyperthyroidism Grade ≥ 3	Withhold* For patients with Grade 3 or Grade 4 endocrinopathy that improved to Grade 2 or lower and is controlled with hormone replacement, if indicated, continuation of pembrolizumab may be considered after corticosteroid taper, if needed. Otherwise treatment should be discontinued. Hypothyroidism may be managed with replacement therapy without treatment interruption.
Hepatitis	Grade 2 with aspartate aminotransferase (AST) or alanine aminotransferase (ALT) > 3 to 5 times ULN or total bilirubin > 1.5 to 3 times ULN	Withhold*
	Grade ≥ 3 with AST or ALT > 5 times ULN or total bilirubin > 3 times ULN	Permanently discontinue

	In case of liver metastasis with baseline Grade 2 elevation of AST or ALT, hepatitis with AST or ALT increases $\geq 50\%$ and lasts $\geq 1$ week	Permanently discontinue
<b>Infusion-related reactions</b>	Grade 3 or 4	Permanently discontinue

Note: toxicity grades are in accordance with National Cancer Institute Common Terminology Criteria for Adverse Events Version 4.0 (NCI-CTCAE v.4).

\* until adverse reactions recover to Grade 0-1.

KEYTRUDA should be permanently discontinued:

- For Grade 4 toxicity except for:
  - endocrinopathies that are controlled with replacement hormones or
  - haematological toxicity, only in patients with cHL in which KEYTRUDA should be withheld until adverse reactions recover to Grade 0-1
- If corticosteroid dosing cannot be reduced to  $\leq 10$  mg prednisone or equivalent per day within 12 weeks
- If a treatment-related toxicity does not resolve to Grade 0-1 within 12 weeks after last dose of KEYTRUDA
- If any event occurs a second time at Grade  $\geq 3$  severity.

Patients treated with KEYTRUDA must be given the Patient Alert Card and be informed about the risks of KEYTRUDA (see also package leaflet).

### Special populations

#### *Elderly*

No overall differences in safety or efficacy were reported between elderly patients ( $\geq 65$  years) and younger patients ( $< 65$  years). No dose adjustment is necessary in this population.

Data from patients  $\geq 65$  years are too limited to draw conclusions on cHL population (see section 5.1).

#### *Renal impairment*

No dose adjustment is needed for patients with mild or moderate renal impairment. KEYTRUDA has not been studied in patients with severe renal impairment (see sections 4.4 and 5.2).

#### *Hepatic impairment*

No dose adjustment is needed for patients with mild hepatic impairment. KEYTRUDA has not been studied in patients with moderate or severe hepatic impairment (see sections 4.4 and 5.2).

#### *Ocular melanoma*

There are limited data on the safety and efficacy of KEYTRUDA in patients with ocular melanoma (see section 5.1).

#### *Eastern Cooperative Oncology Group (ECOG) performance status score $\geq 2$*

Patients with ECOG performance status score  $\geq 2$  were excluded from the clinical trials (see sections 4.4 and 5.1).

#### *Paediatric population*

The safety and efficacy of KEYTRUDA in children below 18 years of age have not yet been established. No data are available.

### Method of administration

KEYTRUDA must be administered by intravenous infusion over 30 minutes. KEYTRUDA must not be administered as an intravenous push or bolus injection.



For instructions on dilution of the medicinal product before administration, see section 6.6.

### 4.3 Contraindications

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

### 4.4 Special warnings and precautions for use

#### Assessment of PD-L1 status

When assessing the PD-L1 status of the tumour, it is important that a well-validated and robust methodology is chosen to minimise false negative or false positive determinations.

#### Immune-related adverse reactions

Most immune-related adverse reactions occurring during treatment with pembrolizumab were reversible and managed with interruptions of pembrolizumab, administration of corticosteroids and/or supportive care. Immune-related adverse reactions have also occurred after the last dose of pembrolizumab. Immune-related adverse reactions affecting more than one body system can occur simultaneously.

For suspected immune-related adverse reactions, adequate evaluation to confirm aetiology or exclude other causes should be ensured. Based on the severity of the adverse reaction, pembrolizumab should be withheld and corticosteroids administered. Upon improvement to Grade  $\leq 1$ , corticosteroid taper should be initiated and continued over at least 1 month. Based on limited data from clinical studies in patients whose immune-related adverse reactions could not be controlled with corticosteroid use, administration of other systemic immunosuppressants can be considered.

Pembrolizumab may be restarted within 12 weeks after last dose of KEYTRUDA if the adverse reaction remains at Grade  $\leq 1$  and corticosteroid dose has been reduced to  $\leq 10$  mg prednisone or equivalent per day.

Pembrolizumab must be permanently discontinued for any Grade 3 immune-related adverse reaction that recurs and for any Grade 4 immune-related adverse reaction toxicity, except for endocrinopathies that are controlled with replacement hormones (see sections 4.2 and 4.8).

#### *Immune-related pneumonitis*

Pneumonitis, including fatal cases, has been reported in patients receiving pembrolizumab (see section 4.8). Patients should be monitored for signs and symptoms of pneumonitis. Suspected pneumonitis should be confirmed with radiographic imaging and other causes excluded.

Corticosteroids should be administered for Grade  $\geq 2$  events (initial dose of 1-2 mg/kg/day prednisone or equivalent followed by a taper); pembrolizumab should be withheld for Grade 2 pneumonitis, and permanently discontinued for Grade 3, Grade 4 or recurrent Grade 2 pneumonitis (see section 4.2).

#### *Immune-related colitis*

Colitis has been reported in patients receiving pembrolizumab (see section 4.8). Patients should be monitored for signs and symptoms of colitis, and other causes excluded. Corticosteroids should be administered for Grade  $\geq 2$  events (initial dose of 1-2 mg/kg/day prednisone or equivalent followed by a taper); pembrolizumab should be withheld for Grade 2 or Grade 3 colitis, and permanently discontinued for Grade 4 colitis (see section 4.2). The potential risk of gastrointestinal perforation should be taken into consideration.

#### *Immune-related hepatitis*

Hepatitis has been reported in patients receiving pembrolizumab (see section 4.8). Patients should be monitored for changes in liver function (at the start of treatment, periodically during treatment and as indicated based on clinical evaluation) and symptoms of hepatitis, and other causes excluded. Corticosteroids should be administered (initial dose of 0.5-1 mg/kg/day (for Grade 2 events) and

1-2 mg/kg/day (for Grade  $\geq$  3 events) prednisone or equivalent followed by a taper) and, based on severity of liver enzyme elevations, pembrolizumab should be withheld or discontinued (see section 4.2).

#### *Immune-related nephritis*

Nephritis has been reported in patients receiving pembrolizumab (see section 4.8). Patients should be monitored for changes in renal function, and other causes of renal dysfunction excluded.

Corticosteroids should be administered for Grade  $\geq$  2 events (initial dose of 1-2 mg/kg/day prednisone or equivalent followed by a taper) and, based on severity of creatinine elevations, pembrolizumab should be withheld for Grade 2, and permanently discontinued for Grade 3 or Grade 4 nephritis (see section 4.2).

#### *Immune-related endocrinopathies*

Severe endocrinopathies, including hypophysitis, type 1 diabetes mellitus, diabetic ketoacidosis, hypothyroidism, and hyperthyroidism have been observed with pembrolizumab treatment.

Long-term hormone replacement therapy may be necessary in cases of immune-related endocrinopathies.

Hypophysitis has been reported in patients receiving pembrolizumab (see section 4.8). Patients should be monitored for signs and symptoms of hypophysitis (including hypopituitarism and secondary adrenal insufficiency) and other causes excluded. Corticosteroids to treat secondary adrenal insufficiency and other hormone replacement should be administered as clinically indicated, and pembrolizumab should be withheld for symptomatic hypophysitis until the event is controlled with hormone replacement. Continuation of pembrolizumab may be considered, after corticosteroid taper, if needed (see section 4.2). Pituitary function and hormone levels should be monitored to ensure appropriate hormone replacement.

Type 1 diabetes mellitus, including diabetic ketoacidosis, has been reported in patients receiving pembrolizumab (see section 4.8). Patients should be monitored for hyperglycaemia or other signs and symptoms of diabetes. Insulin should be administered for type 1 diabetes, and pembrolizumab should be withheld in cases of Grade 3 hyperglycaemia until metabolic control is achieved (see section 4.2).

Thyroid disorders, including hypothyroidism, hyperthyroidism and thyroiditis, have been reported in patients receiving pembrolizumab and can occur at any time during treatment; therefore, patients should be monitored for changes in thyroid function (at the start of treatment, periodically during treatment and as indicated based on clinical evaluation) and clinical signs and symptoms of thyroid disorders. Hypothyroidism may be managed with replacement therapy without treatment interruption and without corticosteroids. Hyperthyroidism may be managed symptomatically. Pembrolizumab should be withheld for Grade  $\geq$  3 until recovery to Grade  $\leq$  1 hyperthyroidism. For patients with Grade 3 or Grade 4 hyperthyroidism that improved to Grade 2 or lower, continuation of pembrolizumab may be considered, after corticosteroid taper, if needed (see sections 4.2 and 4.8). Thyroid function and hormone levels should be monitored to ensure appropriate hormone replacement.

#### *Other immune-related adverse reactions*

The following additional clinically significant, immune-related adverse reactions have been reported in patients receiving pembrolizumab: uveitis, arthritis, myositis, pancreatitis, severe skin reactions, Guillain-Barré syndrome, myasthenic syndrome, haemolytic anaemia and partial seizures arising in a patient with inflammatory foci in brain parenchyma (see section 4.8).

Immune-related adverse reactions, including severe and fatal cases, have been reported in clinical trials or in post-marketing experience.

Based on the severity of the adverse reaction, pembrolizumab should be withheld and corticosteroids administered.

Pembrolizumab may be restarted within 12 weeks after last dose of KEYTRUDA if the adverse reaction remains at Grade  $\leq 1$  and corticosteroid dose has been reduced to  $\leq 10$  mg prednisone or equivalent per day.

Pembrolizumab must be permanently discontinued for any Grade 3 immune related adverse reaction that recurs and for any Grade 4 immune related adverse reaction toxicity (see sections 4.2 and 4.8).

#### Infusion-related reactions

Severe infusion-related reactions have been reported in patients receiving pembrolizumab (see section 4.8). For severe infusion reactions, infusion should be stopped and pembrolizumab permanently discontinued (see section 4.2). Patients with mild or moderate infusion reaction may continue to receive pembrolizumab with close monitoring; premedication with antipyretic and antihistamine may be considered.

#### Complications of allogeneic Haematopoietic Stem Cell Transplant (HSCT) in classical Hodgkin lymphoma

Cases of GVHD and hepatic veno-occlusive disease (VOD) have been observed in patients undergoing allogeneic HSCT after previous exposure to pembrolizumab. Until further data become available, careful consideration to the potential benefits of HSCT and the possible increased risk of transplant-related complications should be made case by case (see section 4.8).

#### Patients excluded from clinical trials

Patients with the following conditions were excluded from clinical trials: active CNS metastases; ECOG PS  $\geq 2$ ; HIV, hepatitis B or hepatitis C infection; active systemic autoimmune disease; interstitial lung disease; prior pneumonitis requiring systemic corticosteroid therapy; a history of severe hypersensitivity to another monoclonal antibody; receiving immunosuppressive therapy and a history of severe immune-related adverse reactions from treatment with ipilimumab, defined as any Grade 4 toxicity or Grade 3 toxicity requiring corticosteroid treatment ( $> 10$  mg/day prednisone or equivalent) for greater than 12 weeks. Patients with active infections were excluded from clinical trials and were required to have their infection treated prior to receiving pembrolizumab. Patients with active infections occurring during treatment with pembrolizumab were managed with appropriate medical therapy. Patients with clinically significant renal (creatinine  $> 1.5$  x ULN) or hepatic (bilirubin  $> 1.5$  x ULN, ALT, AST  $> 2.5$  x ULN in the absence of liver metastases) abnormalities at baseline were excluded from clinical trials, therefore information is limited in patients with severe renal and moderate to severe hepatic impairment.

For subjects with relapsed or refractory classical Hodgkin lymphoma, clinical data for the use of pembrolizumab in patients ineligible to ASCT due to reasons other than failure to salvage chemotherapy are limited (see section 5.1).

After careful consideration of the potential increased risk, pembrolizumab may be used with appropriate medical management in these patients.

#### Patient Alert Card

All prescribers of KEYTRUDA must be familiar with the Physician Information and Management Guidelines. The prescriber must discuss the risks of KEYTRUDA therapy with the patient. The patient will be provided with the Patient Alert Card with each prescription.

#### **4.5 Interaction with other medicinal products and other forms of interaction**

No formal pharmacokinetic drug interaction studies have been conducted with pembrolizumab. Since pembrolizumab is cleared from the circulation through catabolism, no metabolic drug-drug interactions are expected.

The use of systemic corticosteroids or immunosuppressants before starting pembrolizumab should be avoided because of their potential interference with the pharmacodynamic activity and efficacy of pembrolizumab. However, systemic corticosteroids or other immunosuppressants can be used after starting pembrolizumab to treat immune-related adverse reactions (see section 4.4).

#### **4.6 Fertility, pregnancy and lactation**

##### Women of childbearing potential

Women of childbearing potential should use effective contraception during treatment with pembrolizumab and for at least 4 months after the last dose of pembrolizumab.

##### Pregnancy

There are no data on the use of pembrolizumab in pregnant women. Animal reproduction studies have not been conducted with pembrolizumab; however, in murine models of pregnancy blockade of PD-L1 signaling has been shown to disrupt tolerance to the foetus and to result in an increased foetal loss (see section 5.3). These results indicate a potential risk, based on its mechanism of action, that administration of pembrolizumab during pregnancy could cause foetal harm, including increased rates of abortion or stillbirth. Human immunoglobulins G4 (IgG4) are known to cross the placental barrier; therefore, being an IgG4, pembrolizumab has the potential to be transmitted from the mother to the developing foetus. Pembrolizumab should not be used during pregnancy unless the clinical condition of the woman requires treatment with pembrolizumab.

##### Breast-feeding

It is unknown whether pembrolizumab is secreted in human milk. Since it is known that antibodies can be secreted in human milk, a risk to the newborns/infants cannot be excluded. A decision should be made whether to discontinue breast-feeding or to discontinue pembrolizumab, taking into account the benefit of breast-feeding for the child and the benefit of pembrolizumab therapy for the woman.

##### Fertility

No clinical data are available on the possible effects of pembrolizumab on fertility. There were no notable effects in the male and female reproductive organs in monkeys based on 1-month and 6-month repeat dose toxicity studies (see section 5.3).

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

Pembrolizumab may have a minor influence on the ability to drive and use machines. Fatigue has been reported following administration of pembrolizumab (see section 4.8).

#### **4.8 Undesirable effects**

##### Summary of the safety profile

Pembrolizumab is most commonly associated with immune-related adverse reactions. Most of these, including severe reactions, resolved following initiation of appropriate medical therapy or withdrawal of pembrolizumab (see “Description of selected adverse reactions” below).

The safety of pembrolizumab has been evaluated in 3,194 patients with advanced melanoma, NSCLC or cHL across four doses (2 mg/kg every 3 weeks, 200 mg every 3 weeks, or 10 mg/kg every 2 or 3 weeks) in clinical studies. In this patient population, the most common adverse reactions (> 10%) with pembrolizumab were fatigue (22%), pruritus (15%), rash (13%), diarrhoea (12%) and

nausea (10%). The majority of adverse reactions reported were of Grade 1 or 2 severity. The most serious adverse reactions were immune-related adverse reactions and severe infusion-related reactions (see section 4.4).

#### Tabulated list of adverse reactions

Adverse reactions reported in 3,194 patients treated with pembrolizumab in clinical trials are reported in Table 2. These reactions are presented by system organ class and by frequency. Frequencies are defined as: very common ( $\geq 1/10$ ); common ( $\geq 1/100$  to  $< 1/10$ ); uncommon ( $\geq 1/1,000$  to  $< 1/100$ ); rare ( $\geq 1/10,000$  to  $< 1/1,000$ ); very rare ( $< 1/10,000$ ). Within each frequency grouping, adverse reactions are presented in the order of decreasing seriousness.

**Table 2: Adverse reactions in patients treated with pembrolizumab in clinical trials**

<b>Blood and lymphatic system disorders</b>	
Common	anaemia
Uncommon	neutropenia, thrombocytopenia, leukopenia, lymphopenia, eosinophilia
Rare	immune thrombocytopenic purpura, haemolytic anaemia
<b>Immune system disorders</b>	
Common	infusion related reaction <sup>a</sup>
<b>Endocrine disorders</b>	
Common	hyperthyroidism, hypothyroidism <sup>b</sup>
Uncommon	hypophysitis <sup>c</sup> , adrenal insufficiency, thyroiditis
<b>Metabolism and nutrition disorders</b>	
Common	decreased appetite
Uncommon	type 1 diabetes mellitus <sup>d</sup> , hyponatraemia, hypokalaemia, hypocalcaemia
<b>Psychiatric disorders</b>	
Uncommon	insomnia
<b>Nervous system disorders</b>	
Common	headache, dizziness, dysgeusia
Uncommon	epilepsy, lethargy, neuropathy peripheral
Rare	Guillain-Barré syndrome, myasthenic syndrome
<b>Eye disorders</b>	
Common	dry eye
Uncommon	uveitis <sup>e</sup>
<b>Vascular disorders</b>	
Uncommon	hypertension
<b>Respiratory, thoracic and mediastinal disorders</b>	
Common	pneumonitis <sup>f</sup> , dyspnea, cough
<b>Gastrointestinal disorders</b>	
Very common	diarrhoea, nausea
Common	colitis <sup>g</sup> , vomiting, abdominal pain <sup>h</sup> , constipation, dry mouth
Uncommon	pancreatitis <sup>i</sup>
Rare	small intestinal perforation
<b>Hepatobiliary disorders</b>	
Uncommon	hepatitis <sup>j</sup>
<b>Skin and subcutaneous tissue disorders</b>	
Very common	rash <sup>k</sup> , pruritus <sup>l</sup>
Common	severe skin reactions <sup>m</sup> , vitiligo <sup>n</sup> , dry skin, erythema, eczema
Uncommon	lichenoid keratosis <sup>o</sup> , psoriasis, alopecia, dermatitis, dermatitis acneiform, hair colour changes, papule
Rare	erythema nodosum
<b>Musculoskeletal and connective tissue disorders</b>	
Common	arthralgia, myositis <sup>p</sup> , musculoskeletal pain <sup>q</sup> , pain in extremity, arthritis <sup>r</sup>
Uncommon	tenosynovitis <sup>s</sup>

<b>Renal and urinary disorders</b>	
Uncommon	nephritis <sup>†</sup>
<b>General disorders and administration site conditions</b>	
Very common	fatigue
Common	asthenia, oedema <sup>u</sup> , pyrexia, influenza like illness, chills
<b>Investigations</b>	
Common	alanine aminotransferase increased, aspartate aminotransferase increased, blood alkaline phosphatase increased, blood creatinine increased
Uncommon	amylase increased, blood bilirubin increased, hypercalcaemia

The following terms represent a group of related events that describe a medical condition rather than a single event.

- a. infusion-related reactions (drug hypersensitivity, anaphylactic reaction, hypersensitivity and cytokine release syndrome)
- b. hypothyroidism (myxoedema)
- c. hypophysitis (hypopituitarism)
- d. type 1 diabetes mellitus (diabetic ketoacidosis)
- e. uveitis (iritis and iridocyclitis)
- f. pneumonitis (interstitial lung disease)
- g. colitis (colitis microscopic and enterocolitis)
- h. abdominal pain (abdominal discomfort, abdominal pain upper and abdominal pain lower)
- i. pancreatitis (autoimmune pancreatitis and pancreatitis acute)
- j. hepatitis (autoimmune hepatitis and drug induced liver injury)
- k. rash (rash erythematous, rash follicular, rash generalised, rash macular, rash maculo-papular, rash papular, rash pruritic, rash vesicular and genital rash)
- l. pruritus (urticaria, urticaria papular, pruritus generalized and pruritus genital)
- m. severe skin reactions (dermatitis exfoliative, erythema multiforme, exfoliative rash, pemphigoid, Stevens-Johnson syndrome and Grade  $\geq 3$  of the following: pruritus, rash, rash generalised and rash maculo-papular, dermatitis psoriasiform)
- n. vitiligo (skin depigmentation, skin hypopigmentation and hypopigmentation of the eyelid)
- o. lichenoid keratosis (lichen planus and lichen sclerosus)
- p. myositis (myalgia, myopathy, polymyalgia rheumatica and rhabdomyolysis)
- q. musculoskeletal pain (musculoskeletal discomfort, back pain, musculoskeletal stiffness, musculoskeletal chest pain and torticollis)
- r. arthritis (joint swelling, polyarthritis and joint effusion)
- s. tenosynovitis (tendonitis, synovitis and tendon pain)
- t. nephritis (nephritis autoimmune, tubulointerstitial nephritis and renal failure or renal failure acute with evidence of nephritis, nephrotic syndrome)
- u. oedema (oedema peripheral, generalised oedema, fluid overload, fluid retention, eyelid oedema and lip oedema, face oedema, localized oedema and periorbital oedema)

#### Description of selected adverse reactions

Data for the following immune-related adverse reactions are based on patients who received pembrolizumab across three doses (2 mg/kg every 3 weeks or 10 mg/kg every 2 or 3 weeks) in clinical studies (see section 5.1). The management guidelines for these adverse reactions are described in section 4.4.

#### Immune-related adverse reactions (see section 4.4)

##### *Immune-related pneumonitis*

Pneumonitis occurred in 113 (3.5%) patients, including Grade 2, 3, 4 or 5 cases in 49 (1.5%), 27 (0.8%), 9 (0.3%) and 4 (0.1%) patients, respectively, receiving pembrolizumab. The median time to onset of pneumonitis was 3.1 months (range 2 days to 19.3 months). The median duration was 1.9 months (range 1 day to 17.2+ months). Pneumonitis led to discontinuation of pembrolizumab in 48 (1.5%) patients. Pneumonitis resolved in 68 patients, 1 with sequelae.

##### *Immune-related colitis*

Colitis occurred in 56 (1.8%) patients, including Grade 2, 3 or 4 cases in 12 (0.4%), 35 (1.1%) and 2 (<0.1%) patients, respectively, receiving pembrolizumab. The median time to onset of colitis was 3.5 months (range 7 days to 16.2 months). The median duration was 1.4 months (range 1 day to

8.7+ months). Colitis led to discontinuation of pembrolizumab in 15 (0.5%) patients. Colitis resolved in 47 patients.

#### *Immune-related hepatitis*

Hepatitis occurred in 19 (0.6%) patients, including Grade 2, 3 or 4 cases in 4 (0.1%), 12 (0.4%) and 2 (<0.1%) patients, respectively, receiving pembrolizumab. The median time to onset of hepatitis was 1.3 months (range 8 days to 21.4 months). The median duration was 1.8 months (range 8 days to 20.9+ months). Hepatitis led to discontinuation of pembrolizumab in 6 (0.2%) patients. Hepatitis resolved in 15 patients.

#### *Immune-related nephritis*

Nephritis occurred in 11 (0.3%) patients, including Grade 2, 3 or 4 cases in 3 (0.1%), 6 (0.2%) and 1 (<0.1%) patients, respectively, receiving pembrolizumab. The median time to onset of nephritis was 4.9 months (range 12 days to 12.8 months). The median duration was 3.3 months (range 12 days to 10.5+ months). Nephritis led to discontinuation of pembrolizumab in 4 (0.1%) patients. Nephritis resolved in 6 patients.

#### *Immune-related endocrinopathies*

Hypophysitis occurred in 18 (0.6%) patients, including Grade 2, 3 or 4 cases in 6 (0.2%), 9 (0.3%) and 1 (<0.1%) patients, respectively, receiving pembrolizumab. The median time to onset of hypophysitis was 4.0 months (range 1 day to 11.9 months). The median duration was 4.7 months (range 8+ days to 12.7+ months). Hypophysitis led to discontinuation of pembrolizumab in 4 (0.1%) patients. Hypophysitis resolved in 7 patients, 2 with sequelae.

Hyperthyroidism occurred in 115 (3.6%) patients, including Grade 2 or 3 cases in 27 (0.8%) and 4 (0.1%) patients, respectively, receiving pembrolizumab. The median time to onset of hyperthyroidism was 1.4 months (range 1 day to 21.9 months). The median duration was 2.0 months (range 10 days to 15.0+ months). Hyperthyroidism led to discontinuation of pembrolizumab in 2 (0.1%) patients. Hyperthyroidism resolved in 88 (77%) patients, 1 with sequelae.

Hypothyroidism occurred in 285 (8.9%) patients, including Grade 2 or 3 cases in 204 (6.4%) and 4 (0.1%) patients, respectively, receiving pembrolizumab. The median time to onset of hypothyroidism was 3.5 months (range 1 day to 18.9 months). The median duration was not reached (range 2 days to 29.9+ months). One patient (<0.1%) discontinued pembrolizumab due to hypothyroidism. Hypothyroidism resolved in 67 (24%) patients, 4 with sequelae. In patients with cHL (n=241) the incidence of hypothyroidism was 14.1% (all Grades) with 0.4% Grade 3.

#### *Complications of allogeneic HSCT in classical Hodgkin lymphoma*

Of 23 patients with cHL who proceeded to allogeneic HSCT after treatment with pembrolizumab, 6 patients (26%) developed graft-versus-host-disease (GVHD), one of which was fatal, and 2 patients (9%) developed severe hepatic VOD after reduced-intensity conditioning, one of which was fatal. The 23 patients had a median follow-up from subsequent allogeneic HSCT of 5.1 months (range: 0-26.2 months).

#### Immunogenicity

In clinical studies in patients treated with pembrolizumab 2 mg/kg every 3 weeks, 200 mg every 3 weeks, or 10 mg/kg every two or three weeks, 29 (1.8%) of 1,619 evaluable patients tested positive for treatment-emergent antibodies to pembrolizumab. There was no evidence of an altered pharmacokinetic or safety profile with anti-pembrolizumab binding antibody development.

#### Reporting of suspected adverse reactions

Reporting suspected adverse reactions after authorisation of the medicinal product is important. It allows continued monitoring of the benefit/risk balance of the medicinal product. Healthcare professionals are asked to report any suspected adverse reactions via [the national reporting system listed in Appendix V](#).

## 4.9 Overdose

There is no information on overdose with pembrolizumab.

In case of overdose, patients must be closely monitored for signs or symptoms of adverse reactions, and appropriate symptomatic treatment instituted.

## 5. PHARMACOLOGICAL PROPERTIES

### 5.1 Pharmacodynamic properties

Pharmacotherapeutic group: Antineoplastic agents, monoclonal antibodies. ATC code: L01XC18

#### Mechanism of action

KEYTRUDA is a humanised monoclonal antibody which binds to the programmed cell death-1 (PD-1) receptor and blocks its interaction with ligands PD-L1 and PD-L2. The PD-1 receptor is a negative regulator of T-cell activity that has been shown to be involved in the control of T-cell immune responses. KEYTRUDA potentiates T-cell responses, including anti-tumour responses, through blockade of PD-1 binding to PD-L1 and PD-L2, which are expressed in antigen presenting cells and may be expressed by tumours or other cells in the tumour microenvironment.

#### Clinical efficacy and safety

##### Melanoma

##### KEYNOTE-006: Controlled trial in melanoma patients naïve to treatment with ipilimumab

The safety and efficacy of pembrolizumab were investigated in KEYNOTE-006, a multicentre, controlled, Phase III study for the treatment of advanced melanoma in patients who were naïve to ipilimumab. Patients were randomised (1:1:1) to receive pembrolizumab 10 mg/kg every 2 (n=279) or 3 weeks (n=277) or ipilimumab 3 mg/kg every 3 weeks (n=278). Patients with BRAF V600E mutant melanoma were not required to have received prior BRAF inhibitor therapy.

Patients were treated with pembrolizumab until disease progression or unacceptable toxicity. Clinically stable patients with initial evidence of disease progression were permitted to remain on treatment until disease progression was confirmed. Assessment of tumour status was performed at 12 weeks, then every 6 weeks through week 48, followed by every 12 weeks thereafter.

Of the 834 patients, 60% were male, 44% were  $\geq 65$  years (median age was 62 years [range 18-89]) and 98% were white. Sixty-five percent of patients had M1c stage, 9% had a history of brain metastases, 66% had no and 34% had one prior therapy. Thirty-one percent had an ECOG Performance Status of 1, 69% had ECOG Performance Status of 0 and 32% had elevated LDH. BRAF mutations were reported in 302 (36%) patients. Among patients with BRAF mutant tumours, 139 (46%) were previously treated with a BRAF inhibitor.

The primary efficacy outcome measures were progression free survival (PFS; as assessed by Integrated Radiology and Oncology Assessment [IRO] review using Response Evaluation Criteria in Solid Tumours [RECIST], version 1.1) and overall survival (OS). Secondary efficacy outcome measures were overall response rate (ORR) and response duration. Table 3 summarises key efficacy measures in patients naïve to treatment with ipilimumab, and the Kaplan-Meier curves for OS and PFS are shown in Figures 1 and 2.



**Table 3: Response to pembrolizumab 10 mg/kg every 2 or 3 weeks in patients with ipilimumab naïve advanced melanoma in KEYNOTE-006\***

Endpoint	Pembrolizumab 10 mg/kg every 3 weeks n=277	Pembrolizumab 10 mg/kg every 2 weeks n=279	Ipilimumab 3 mg/kg every 3 weeks n=278
<b>OS</b>			
Number (%) of patients with event	92 (33%)	85 (30%)	112 (40%)
Hazard ratio* (95% CI)	0.69 (0.52, 0.90)	0.63 (0.47, 0.83)	---
p-Value <sup>†</sup>	0.00358	0.00052	---
Median in months (95% CI)	Not reached (NA, NA)	Not reached (NA, NA)	Not reached (13, NA)
<b>PFS</b>			
Number (%) of patients with event	157 (57%)	157 (56%)	188 (68%)
Hazard ratio* (95% CI)	0.58 (0.47, 0.72)	0.58 (0.46, 0.72)	---
p-Value <sup>†</sup>	< 0.00001	< 0.00001	---
Median in months (95% CI)	4.1 (2.9, 6.9)	5.5 (3.4, 6.9)	2.8 (2.8, 2.9)
<b>Best overall response</b>			
ORR % (95% CI)	33% (27, 39)	34% (28, 40)	12% (8, 16)
Complete response %	6%	5%	1%
Partial response %	27%	29%	10%
<b>Response duration<sup>‡</sup></b>			
Median in months (range)	Not reached (1.4+, 8.1+)	8.3 (1.4+, 8.3)	Not reached (1.1+, 7.9+)
% ongoing	97%	89%	88%

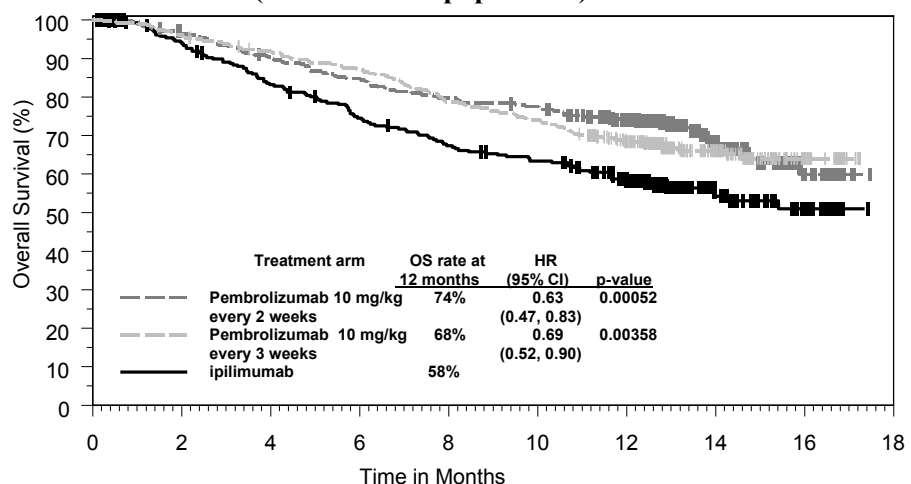
\* Hazard ratio (pembrolizumab compared to ipilimumab) based on the stratified Cox proportional hazard model

<sup>†</sup> Based on stratified Log rank test

<sup>‡</sup> Based on patients with a best overall response as confirmed complete or partial response

NA = not available

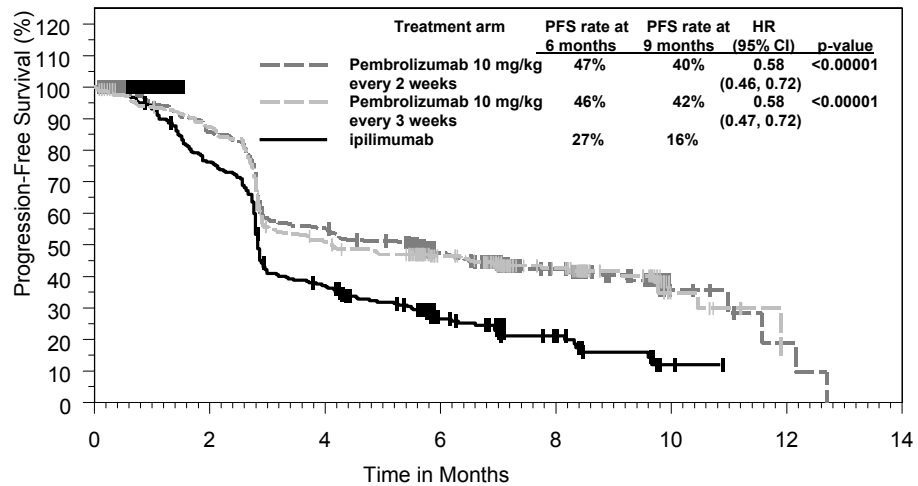
**Figure 1: Kaplan-Meier curve for overall survival by treatment arm in KEYNOTE-006 (intent to treat population)**



Number at Risk

Pembrolizumab 10 mg/kg every 2 weeks:	279	266	248	233	219	212	177	67	19	0
Pembrolizumab 10 mg/kg every 3 weeks:	277	266	251	238	215	202	158	71	18	0
ipilimumab:	278	242	212	188	169	157	117	51	17	0

**Figure 2: Kaplan-Meier curve for progression-free survival by treatment arm in KEYNOTE-006 (intent to treat population)**



Number at Risk	0	2	4	6	8	10	12	14
Pembrolizumab 10 mg/kg every 2 weeks:	279	231	147	98	49	7	2	0
Pembrolizumab 10 mg/kg every 3 weeks:	277	235	133	95	53	7	1	1
ipilimumab:	278	186	88	42	18	2	0	0

***KEYNOTE-002: Controlled trial in melanoma patients previously treated with ipilimumab***

The safety and efficacy of pembrolizumab were investigated in KEYNOTE-002, a multicentre, controlled study for the treatment of advanced melanoma in patients previously treated with ipilimumab and if BRAF V600 mutation-positive, with a BRAF or MEK inhibitor. Patients were randomised (1:1:1) to receive pembrolizumab at a dose of 2 (n=180) or 10 mg/kg (n=181) every 3 weeks or chemotherapy (n=179; including dacarbazine, temozolomide, carboplatin, paclitaxel, or carboplatin+paclitaxel). The study excluded patients with autoimmune disease or those receiving immunosuppression; further exclusion criteria were a history of severe or life-threatening immune-related adverse reactions from treatment with ipilimumab, defined as any Grade 4 toxicity or Grade 3 toxicity requiring corticosteroid treatment (> 10 mg/day prednisone or equivalent dose) for greater than 12 weeks; ongoing adverse reactions ≥ Grade 2 from previous treatment with ipilimumab; previous severe hypersensitivity to other monoclonal antibodies; a history of pneumonitis or interstitial lung disease; HIV, hepatitis B or hepatitis C infection and ECOG Performance Status ≥ 2.

Patients were treated with pembrolizumab until disease progression or unacceptable toxicity. Clinically stable patients with initial evidence of disease progression were permitted to remain on treatment until disease progression was confirmed. Assessment of tumour status was performed at 12 weeks, then every 6 weeks through week 48, followed by every 12 weeks thereafter. Patients on chemotherapy who experienced independently verified progression of disease after the first scheduled disease assessment were able to crossover and receive 2 mg/kg or 10 mg/kg of pembrolizumab every 3 weeks in a double blind fashion.

Of the 540 patients, 61% were male, 43% were ≥ 65 years (median age was 62 years [range 15-89]) and 98% were white. Eighty-two percent had M1c stage, 73% had at least two and 32% of patients had three or more prior systemic therapies for advanced melanoma. Forty-five percent had an ECOG Performance Status of 1, 40% had elevated LDH and 23% had a BRAF mutated tumour.

The primary efficacy outcome measures were PFS as assessed by IRO using RECIST version 1.1 and OS. Secondary efficacy outcome measures were ORR and response duration. Table 4 summarises key efficacy measures in patients previously treated with ipilimumab, and the Kaplan-Meier curve for PFS is shown in Figure 3. Both pembrolizumab arms were superior to chemotherapy for PFS, and there was no difference between pembrolizumab doses. OS data were not mature at the time of the PFS analysis. There was no statistically significant difference between pembrolizumab and chemotherapy

in the preliminary OS analysis that was not adjusted for the potentially confounding effects of crossover. Of the patients randomised to the chemotherapy arm, 48% crossed over and subsequently received treatment with pembrolizumab.

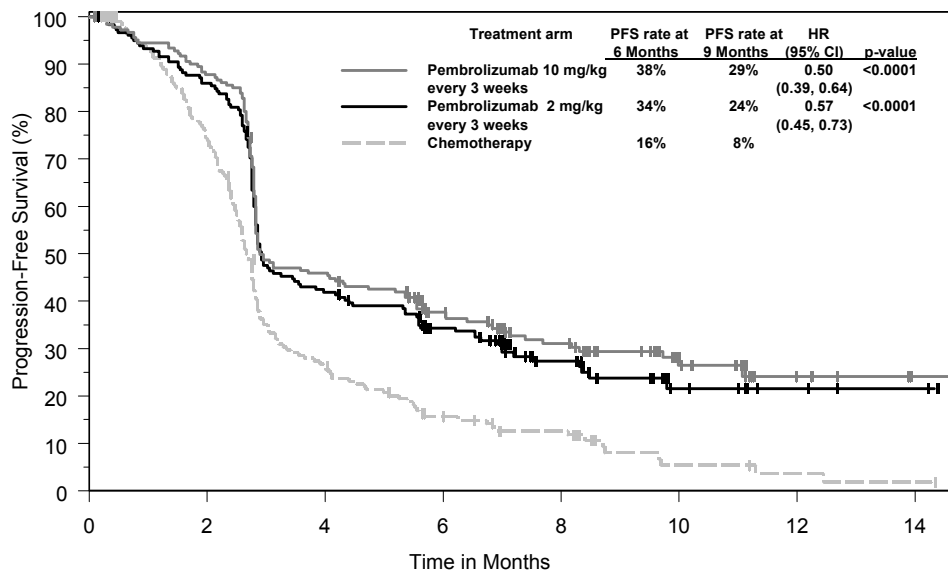
**Table 4: Response to pembrolizumab 2 mg/kg or 10 mg/kg every 3 weeks in patients with unresectable or metastatic melanoma in KEYNOTE-002**

<b>Endpoint</b>	<b>Pembrolizumab 2 mg/kg every 3 weeks n=180</b>	<b>Pembrolizumab 10 mg/kg every 3 weeks n=181</b>	<b>Chemotherapy  n=179</b>
<b>PFS</b>			
Number (%) of patients with event	129 (72%)	126 (70%)	155 (87%)
Hazard ratio* (95% CI)	0.57 (0.45, 0.73)	0.50 (0.39, 0.64)	---
p-Value <sup>†</sup>	< 0.0001	< 0.0001	---
Median in months (95% CI)	2.9 (2.8, 3.8)	2.9 (2.8, 4.7)	2.7 (2.5, 2.8)
<b>OS</b>			
Number (%) of patients with event	73 (41%)	69 (38%)	78 (44%)
Hazard ratio* (95% CI)	0.88 (0.64, 1.22)	0.78 (0.56, 1.08)	---
p-Value <sup>†</sup>	0.2294	0.0664	---
<b>Best overall response</b>			
ORR % (95% CI)	21% (15, 28)	25% (19, 32)	4% (2, 9)
Complete response %	2%	3%	0%
Partial response %	19%	23%	4%
<b>Response duration</b>			
Median in months (range)	Not reached (1.4+, 11.5+)	Not reached (1.2+, 11.1+)	8.5 (1.6+, 9.5)
% ongoing	87%	80%	63%

\* Hazard ratio (pembrolizumab compared to chemotherapy) based on the stratified Cox proportional hazard model

<sup>†</sup> Based on stratified Log rank test

**Figure 3: Kaplan-Meier curve for progression-free survival by treatment arm in KEYNOTE-002 (intent to treat population)**



Number at Risk	0	2	4	6	8	10	12	14
Pembrolizumab 10 mg/kg:	181	158	82	55	39	15	5	1
Pembrolizumab 2 mg/kg:	180	153	74	53	26	9	4	2
Chemotherapy:	179	128	43	22	15	4	2	1

***KEYNOTE-001: Open label study in melanoma patients naïve and previously treated with ipilimumab***

The safety and efficacy of pembrolizumab for patients with advanced melanoma were investigated in an uncontrolled, open-label study, KEYNOTE-001. Efficacy was evaluated for 276 patients from two defined cohorts, one which included patients previously treated with ipilimumab (and if BRAF V600 mutation-positive, with a BRAF or MEK inhibitor) and the other which included patients naïve to treatment with ipilimumab. Patients were randomly assigned to receive pembrolizumab at a dose of 2 mg/kg every 3 weeks or 10 mg/kg every 3 weeks. Patients were treated with pembrolizumab until disease progression or unacceptable toxicity. Clinically stable patients with initial evidence of disease progression were permitted to remain on treatment until disease progression was confirmed. Exclusion criteria were similar to those of KEYNOTE-002.

Of the 89 patients receiving 2 mg/kg of pembrolizumab who were previously treated with ipilimumab, 53% were male, 33% were  $\geq 65$  years of age and the median age was 59 years (range 18-88). All but two patients were white. Eighty-four percent had M1c stage and 8% of patients had a history of brain metastases. Seventy percent had at least two and 35% of patients had three or more prior systemic therapies for advanced melanoma. BRAF mutations were reported in 13% of the study population. All patients with BRAF mutant tumours were previously treated with a BRAF inhibitor.

Of the 51 patients receiving 2 mg/kg of pembrolizumab who were naïve to treatment with ipilimumab, 63% were male, 35% were  $\geq 65$  years of age and the median age was 60 years (range 35-80). All but one patient was white. Sixty-three percent had M1c stage and 2% of patients had a history of brain metastases. Forty-five percent had no prior therapies for advanced melanoma. BRAF mutations were reported in 20 (39%) patients. Among patients with BRAF mutant tumours, 10 (50%) were previously treated with a BRAF inhibitor.

The primary efficacy outcome measure was ORR as assessed by independent review using RECIST 1.1. Secondary efficacy outcome measures were disease control rate (DCR; including complete response, partial response and stable disease), response duration, PFS and OS. Tumour response was assessed at 12-week intervals. Table 5 summarises key efficacy measures in patients previously treated or naïve to treatment with ipilimumab, receiving pembrolizumab at the recommended dose.

**Table 5: Response to pembrolizumab 2 mg/kg every 3 weeks in patients with unresectable or metastatic melanoma in KEYNOTE-001**

Endpoint	Pembrolizumab 2 mg/kg every 3 weeks in patients previously treated with ipilimumab n=89	Pembrolizumab 2 mg/kg every 3 weeks in patients naïve to treatment with ipilimumab n=51
<b>Best Overall Response* by IRO<sup>†</sup></b>		
ORR %, (95% CI)	25% (16, 35)	33% (21, 48)
Complete response	3%	10%
Partial response	21%	24%
Disease Control Rate % <sup>‡</sup>	49%	49%
<b>Response Duration<sup>§</sup></b>		
Median in months (range)	Not reached (2.8+, 14.3+)	Not reached (1.6+, 13.8+)
% ongoing	86% <sup>¶</sup>	82% <sup>#</sup>
<b>PFS</b>		
Median in months (95% CI)	4.9 (2.8, 8.3)	5.5 (2.8, 14.0)
PFS rate at 6 months	43%	50%
<b>OS</b>		
Median in months (95% CI)	Not reached (11, not available)	Not reached (14, not available)
OS rate at 12 months	60%	72%

\* Includes patients without measurable disease at baseline by independent radiology

<sup>†</sup> IRO = Integrated radiology and oncologist assessment using RECIST 1.1

<sup>‡</sup> Based on best response of stable disease or better

<sup>§</sup> Based on patients with a confirmed response by independent review, starting from the date the response was first recorded; n=22 for patients previously treated with ipilimumab; n=17 for patients naïve to treatment with ipilimumab

<sup>¶</sup> Responders were followed for a minimum of 12 months after initiation of therapy

<sup>#</sup> Responders were followed for a minimum of 15 months after initiation of therapy

Results for patients previously treated with ipilimumab (n=84) and naïve to treatment with ipilimumab (n=52) who received 10 mg/kg of pembrolizumab every 3 weeks were similar to those seen in patients who received 2 mg/kg of pembrolizumab every 3 weeks.

#### *Sub-population analyses*

##### BRAF mutation status in melanoma

A subgroup analysis of KEYNOTE-002 in patients who were BRAF wild type (n=415; 77%) or BRAF mutant with prior BRAF treatment (n=125; 23%) was performed. The PFS HRs (pooled pembrolizumab [2 mg/kg or 10 mg/kg every 3 weeks] vs. chemotherapy) were 0.51 (95% CI: 0.41, 0.65) for BRAF wild type and 0.56 (95% CI: 0.37, 0.85) for BRAF mutant with prior BRAF treatment. The PFS HRs for pembrolizumab 2 mg/kg every 3 weeks vs. chemotherapy were 0.51 (95% CI: 0.39, 0.67) for BRAF wild type and 0.74 (95% CI: 0.46, 1.18) for BRAF mutant with prior BRAF treatment. The OS HRs for pooled pembrolizumab vs. chemotherapy were 0.83 (95% CI: 0.60, 1.15) for BRAF wild type and 0.82 (95% CI: 0.47, 1.43) for BRAF mutant with prior BRAF treatment. The OS HRs for pembrolizumab 2 mg/kg every 3 weeks vs. chemotherapy were 0.80 (95% CI: 0.55, 1.18) for BRAF wild type and 1.03 (95% CI: 0.55, 1.91) for BRAF mutant with prior BRAF treatment. ORR for pooled pembrolizumab and pembrolizumab 2 mg/kg every 3 weeks vs. chemotherapy was 27% and 25% vs. 6% for BRAF wild type and 12% and 9% vs. 0% for BRAF mutant with prior BRAF treatment.

A subgroup analysis of KEYNOTE-006 in patients who were BRAF wild type (n=525; 63%), BRAF mutant without prior BRAF treatment (n=163; 20%) and BRAF mutant with prior BRAF treatment (n=139; 17%) was performed. The PFS HRs (pooled pembrolizumab [10 mg/kg every 2 or 3 weeks]

vs. ipilimumab) were 0.57 (95% CI: 0.45, 0.73) for BRAF wild type, 0.50 (95% CI: 0.32, 0.77) for BRAF mutant without prior BRAF treatment, and 0.73 (95% CI: 0.48, 1.11) for BRAF mutant with prior BRAF treatment. The OS HRs for pooled pembrolizumab vs. ipilimumab were 0.61 (95% CI: 0.46, 0.82) for BRAF wild type, 0.69 (95% CI: 0.33, 1.45) for BRAF mutant without prior BRAF treatment, and 0.75 (95% CI: 0.45, 1.26) for BRAF mutant with prior BRAF treatment. ORR for pooled pembrolizumab vs. ipilimumab was 34% vs. 13% for BRAF wild type, 41% vs. 13% for BRAF mutant without prior BRAF treatment, and 21% vs. 6% for BRAF mutant with prior BRAF treatment.

#### PD-L1 status in melanoma

A subgroup analysis of KEYNOTE-002 in patients who were PD-L1 positive (Allred proportion score of  $\geq 2$  representing PD-L1 membrane expression in  $\geq 1\%$  of tumour cells) vs. PD-L1 negative (Allred proportion score of 0 or 1) was performed. PD-L1 expression was tested retrospectively by immunohistochemistry research assay with the 22C3 anti-PD-L1 antibody. Among patients who were evaluable for PD-L1 expression (78%), 69% (n=291) were PD-L1 positive and 31% (n=130) were PD-L1 negative. The PFS HRs (pooled pembrolizumab [2 mg/kg or 10 mg/kg every 3 weeks] vs. chemotherapy) were 0.52 (95% CI: 0.39, 0.68) for PD-L1 positive patients and 0.60 (95% CI: 0.38, 0.94) for PD-L1 negative patients. The PFS HRs for pembrolizumab 2 mg/kg every 3 weeks vs. chemotherapy were 0.54 (95% CI: 0.39, 0.75) for PD-L1 positive patients and 0.89 (95% CI: 0.53, 1.50) for PD-L1 negative patients. The OS HRs for pooled pembrolizumab vs. chemotherapy were 0.82 (95% CI: 0.55, 1.23) for PD-L1 positive patients and 0.77 (95% CI: 0.43, 1.37) for PD-L1 negative patients. The OS HRs for pembrolizumab 2 mg/kg every 3 weeks vs. chemotherapy were 0.93 (95% CI: 0.58, 1.49) for PD-L1 positive patients and 1.19 (95% CI: 0.58, 2.46) for PD-L1 negative patients. ORR for pooled pembrolizumab and pembrolizumab 2 mg/kg every 3 weeks vs. chemotherapy was 26% and 23% vs. 4% for PD-L1 positive patients and 15% and 11% vs. 8% for PD-L1 negative patients.

A subgroup analysis of KEYNOTE-006 in patients who were PD-L1 positive (n=671; 80%) vs. PD-L1 negative (n=150; 18%) was performed. Among patients who were evaluable for PD-L1 expression (98%), 82% were PD-L1 positive and 18% were PD-L1 negative. The PFS HRs (pooled pembrolizumab [10 mg/kg every 2 or 3 weeks] vs. ipilimumab) were 0.53 (95% CI: 0.43, 0.65) for PD-L1 positive patients and 0.73 (95% CI: 0.47, 1.11) for PD-L1 negative patients. The OS HRs for pooled pembrolizumab vs. ipilimumab were 0.56 (95% CI: 0.43, 0.73) for PD-L1 positive patients and 0.95 (95% CI: 0.56, 1.62) for PD-L1 negative patients. The ORRs for the pooled pembrolizumab vs. ipilimumab group were 37% vs. 12% for PD-L1 positive patients and 18% vs. 11% for PD-L1 negative patients.

#### Ocular melanoma

In 20 subjects with ocular melanoma included in KEYNOTE-001, no objective responses were reported; stable disease was reported in 6 patients.

#### NSCLC

##### KEYNOTE-024: Controlled trial of NSCLC patients naive to treatment

The safety and efficacy of pembrolizumab were investigated in KEYNOTE-024, a multicentre, controlled study for the treatment of previously untreated metastatic NSCLC. Patients had PD-L1 expression with a  $\geq 50\%$  tumour proportion score (TPS) based on the PD-L1 IHC 22C3 pharmDx™ Kit. Patients were randomised (1:1) to receive pembrolizumab at a dose of 200 mg every 3 weeks (n=154) or investigator's choice platinum-containing chemotherapy (n=151; including pemetrexed+carboplatin, pemetrexed+cisplatin, gemcitabine+cisplatin, gemcitabine+carboplatin, or paclitaxel+carboplatin. Non-squamous patients could receive pemetrexed maintenance). Patients were treated with pembrolizumab until unacceptable toxicity or disease progression. Treatment could continue beyond disease progression if the patient was clinically stable and was considered to be deriving clinical benefit by the investigator. Patients without disease progression could be treated for up to 24 months. The study excluded patients with EGFR or ALK genomic tumour aberrations; autoimmune disease that required systemic therapy within 2 years of treatment; a medical condition

that required immunosuppression; or who had received more than 30 Gy of thoracic radiation within the prior 26 weeks. Assessment of tumour status was performed every 9 weeks. Patients on chemotherapy who experienced independently-verified progression of disease were able to crossover and receive pembrolizumab.

Among the 305 patients in KEYNOTE-024, baseline characteristics were: median age 65 years (54% age 65 or older); 61% male; 82% White, 15% Asian; and ECOG performance status 0 and 1 in 35% and 65%, respectively. Disease characteristics were squamous (18%) and non-squamous (82%); M1 (99%); and brain metastases (9%).

The primary efficacy outcome measure was PFS as assessed by BICR using RECIST 1.1. Secondary efficacy outcome measures were OS and ORR (as assessed by BICR using RECIST 1.1). Table 6 summarizes key efficacy measures for the entire ITT population.

**Table 6: Efficacy Results in KEYNOTE-024**

<b>Endpoint</b>	<b>Pembrolizumab 200 mg every 3 weeks n=154</b>	<b>Chemotherapy n=151</b>
<b>PFS</b>		
Number (%) of patients with event	73 (47%)	116 (77%)
Hazard ratio* (95% CI)	0.50 (0.37, 0.68)	
p-Value <sup>†</sup>	<0.001	
Median in months (95% CI)	10.3 (6.7, NA)	6.0 (4.2, 6.2)
<b>OS</b>		
Number (%) of patients with event	44 (29%)	64 (42%)
Hazard ratio* (95% CI)	0.60 (0.41, 0.89)	
p-Value <sup>†</sup>	0.005	
Median in months (95% CI)	Not reached (NA, NA)	Not reached (9.4, NA)
<b>Objective response rate</b>		
ORR % (95% CI)	45% (37, 53)	28% (21, 36)
Complete response %	4%	1%
Partial response %	41%	27%
<b>Response Duration<sup>‡</sup></b>		
Median in months (range)	Not reached (1.9+, 14.5+)	6.3 (2.1+, 12.6+)
% with duration ≥ 6 months	88% <sup>§</sup>	59% <sup>¶</sup>

\* Hazard ratio (pembrolizumab compared to chemotherapy) based on the stratified Cox proportional hazard model

† Based on stratified Log rank test

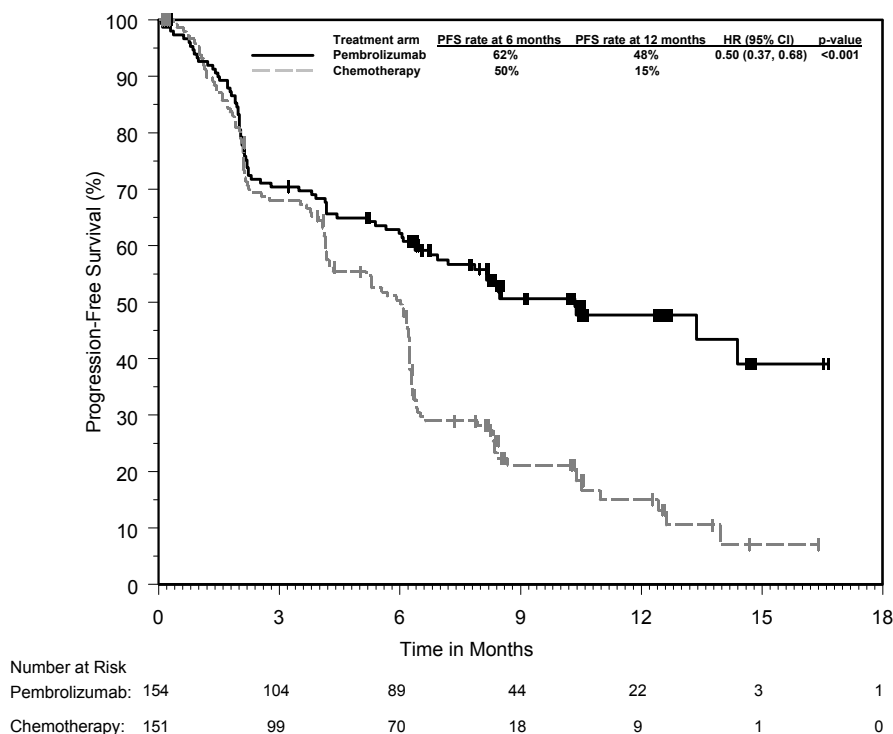
‡ Based on patients with a best overall response as confirmed complete or partial response

§ Based on Kaplan-Meier estimates; includes 43 patients with responses of 6 months or longer

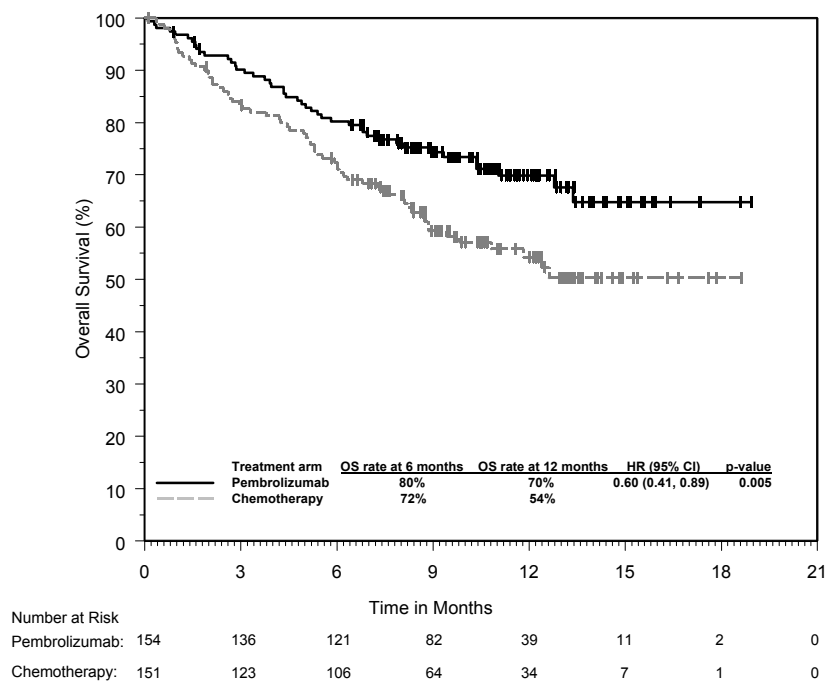
¶ Based on Kaplan-Meier estimates; includes 16 patients with responses of 6 months or longer

NA = not available

**Figure 4: Kaplan-Meier Curve for Progression-Free Survival by Treatment Arm in KEYNOTE-024 (Intent to Treat Population)**



**Figure 5: Kaplan-Meier Curve for Overall Survival by Treatment Arm in KEYNOTE-024 (Intent to Treat Population)**



In a subgroup analysis, a reduced survival benefit of pembrolizumab compared to chemotherapy was observed in the small number of patients who were never-smokers; however, due to the small number of patients, no definitive conclusions can be drawn from these data.



*KEYNOTE-010: Controlled trial of NSCLC patients previously treated with chemotherapy*

The safety and efficacy of pembrolizumab were investigated in KEYNOTE-010, a multicentre, open-label, controlled study for the treatment of advanced NSCLC in patients previously treated with platinum-containing chemotherapy. Patients had PD-L1 expression with a  $\geq 1\%$  TPS based on the PD-L1 IHC 22C3 pharmDx™ Kit. Patients with EGFR activation mutation or ALK translocation also had disease progression on approved therapy for these mutations prior to receiving pembrolizumab. Patients were randomised (1:1:1) to receive pembrolizumab at a dose of 2 (n=344) or 10 mg/kg (n=346) every 3 weeks or docetaxel at a dose of 75 mg/m<sup>2</sup> every 3 weeks (n=343) until disease progression or unacceptable toxicity. The trial excluded patients with autoimmune disease; a medical condition that required immunosuppression; or who had received more than 30 Gy of thoracic radiation within the prior 26 weeks. Assessment of tumour status was performed every 9 weeks.

The baseline characteristics for this population included: median age 63 years (42% age 65 or older); 61% male; 72% White and 21% Asian and 34% and 66% with an ECOG performance status 0 and 1, respectively. Disease characteristics were squamous (21%) and non-squamous (70%); M1 (91%); stable brain metastases (15%) and the incidence of mutations was EGFR (8%) or ALK (1%). Prior therapy included platinum-doublet regimen (100%); patients received one (69%) or two or more (29%) treatment lines.

The primary efficacy outcome measures were OS and PFS as assessed by blinded independent central review (BICR) using RECIST 1.1. Secondary efficacy outcome measures were ORR and response duration. Table 7 summarises key efficacy measures for the entire population (TPS  $\geq 1\%$ ) and for the patients with TPS  $\geq 50\%$  and the Kaplan-Meier curve for OS (TPS  $\geq 1\%$ ) is shown in Figure 6.

**Table 7: Response to pembrolizumab 2 or 10 mg/kg every 3 weeks in previously treated patients with NSCLC in KEYNOTE-010**

Endpoint	Pembrolizumab 2 mg/kg every 3 weeks	Pembrolizumab 10 mg/kg every 3 weeks	Docetaxel 75 mg/m <sup>2</sup> every 3 weeks
<b>TPS ≥ 1%</b>			
Number of patients	344	346	343
<b>OS</b>			
Number (%) of patients with event	172 (50%)	156 (45%)	193 (56%)
Hazard ratio* (95% CI)	0.71 (0.58, 0.88)	0.61 (0.49, 0.75)	---
p-Value <sup>†</sup>	< 0.001 <sup>‡</sup>	< 0.001 <sup>‡</sup>	---
Median in months (95% CI)	10.4 (9.4, 11.9)	12.7 (10.0, 17.3)	8.5 (7.5, 9.8)
<b>PFS<sup>§</sup></b>			
Number (%) of patients with event	266 (77%)	255 (74%)	257 (75%)
Hazard ratio* (95% CI)	0.88 (0.73, 1.04)	0.79 (0.66, 0.94)	---
p-Value <sup>†</sup>	0.068	0.005	---
Median in months (95% CI)	3.9 (3.1, 4.1)	4.0 (2.6, 4.3)	4.0 (3.1, 4.2)
<b>Overall response rate<sup>§</sup></b>			
ORR % <sup>¶</sup> (95% CI)	18% (14, 23)	18% (15, 23)	9% (7, 13)
<b>Response duration<sup>§, #, P</sup></b>			
Median in months (range)	Not reached (0.7+, 20.1+)	Not reached (2.1+, 17.8+)	6.2 (1.4+, 8.8+)
% ongoing	73%	72%	34%
<b>TPS ≥ 50%</b>			
Number of patients	139	151	152
<b>OS</b>			
Number (%) of patients with event	58 (42%)	60 (40%)	86 (57%)
Hazard ratio* (95% CI)	0.54 (0.38, 0.77)	0.50 (0.36, 0.70)	---
p-Value <sup>†</sup>	< 0.001 <sup>‡</sup>	< 0.001 <sup>‡</sup>	---
Median in months (95% CI)	14.9 (10.4, NA)	17.3 (11.8, NA)	8.2 (6.4, 10.7)
<b>PFS<sup>§</sup></b>			
Number (%) of patients with event	89 (64%)	97 (64%)	118 (78%)
Hazard ratio* (95% CI)	0.58 (0.43, 0.77)	0.59 (0.45, 0.78)	---
p-Value <sup>†</sup>	< 0.001 <sup>‡</sup>	< 0.001 <sup>‡</sup>	---
Median in months (95% CI)	5.2 (4.0, 6.5)	5.2 (4.1, 8.1)	4.1 (3.6, 4.3)
<b>Overall response rate<sup>§</sup></b>			
ORR % <sup>¶</sup> (95% CI)	30% (23, 39)	29% (22, 37)	8% (4, 13)
<b>Response duration<sup>§, #, P</sup></b>			
Median in months (range)	Not reached (0.7+, 16.8+)	Not reached (2.1+, 17.8+)	8.1 (2.1+, 8.8+)
% ongoing	76%	75%	33%

\* Hazard ratio (pembrolizumab compared to docetaxel) based on the stratified Cox proportional hazard model

<sup>†</sup> Based on stratified Log rank test

<sup>‡</sup> Statistically significant based on a pre-specified  $\alpha$  level adjusted for multiplicity

<sup>§</sup> Assessed by blinded independent central review (BICR) using RECIST 1.1

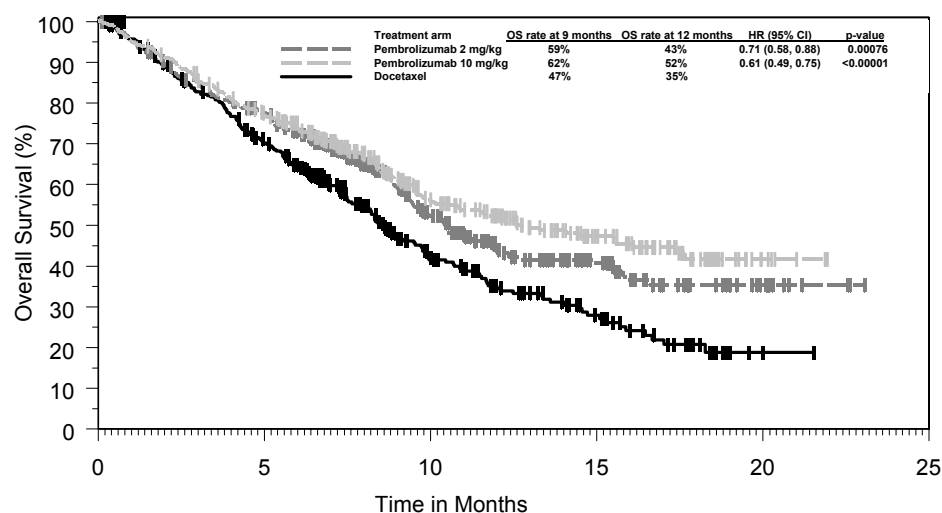
<sup>¶</sup> All responses were partial responses

<sup>#</sup> Based on patients with a best overall response as confirmed complete or partial response

<sup>P</sup> Includes 30, 31 and 2 patients with ongoing responses of 6 months or longer in the pembrolizumab 2 mg/kg, pembrolizumab 10 mg/kg and docetaxel arms respectively

<sup>15</sup> Includes 22, 24 and 1 patients with ongoing responses of 6 months or longer in the pembrolizumab 2 mg/kg, pembrolizumab 10 mg/kg and docetaxel arms respectively

**Figure 6: Kaplan-Meier curve for overall survival by treatment arm in KEYNOTE-010 (patients with PD-L1 expression tumour proportion score  $\geq$  1%, intent to treat population)**



Number at Risk					
Pembrolizumab 2 mg/kg:	344	259	115	49	12
Pembrolizumab 10 mg/kg:	346	255	124	56	6
Docetaxel:	343	212	79	33	1

Efficacy results were similar for the 2 mg/kg and 10 mg/kg pembrolizumab arms. Efficacy results for OS were consistent regardless of the age of tumour specimen (new vs. archival) based on an intergroup comparison.

In subgroup analyses, a reduced survival benefit of pembrolizumab compared to docetaxel was observed for patients who were never-smokers or patients with tumours harbouring EGFR activating mutations who received at least platinum-based chemotherapy and a tyrosine kinase inhibitor; however, due to the small numbers of patients, no definitive conclusions can be drawn from these data.

The efficacy and safety of pembrolizumab in patients with tumours that do not express PD-L1 have not been established.

### Classical Hodgkin lymphoma

#### KEYNOTE-087 and KEYNOTE-013: Open-label studies in patients with refractory or relapsed classical Hodgkin lymphoma (cHL)

The efficacy of pembrolizumab was investigated in KEYNOTE-087 and KEYNOTE-013, two multicentre, open-label studies for the treatment of 241 patients with cHL. These studies enrolled patients who failed ASCT and BV, who were ineligible for ASCT because they were unable to achieve a complete or partial remission to salvage chemotherapy and failed BV, or who failed ASCT and did not receive BV. Five study subjects were ineligible to ASCT due to reasons other than failure to salvage chemotherapy. Both studies included patients regardless of PD-L1 expression. Patients with active, non-infectious pneumonitis, an allogeneic transplant within the past 5 years (or > 5 years but with GVHD), active autoimmune disease or a medical condition that required immunosuppression were ineligible for either trial. Patients received pembrolizumab 200 mg every 3 weeks (n=210; KEYNOTE-087) or 10 mg/kg every 2 weeks (n=31; KEYNOTE-013) until unacceptable toxicity or documented disease progression.

Among KEYNOTE-087 patients, the baseline characteristics were median age 35 years (9% age 65 or older); 54% male; 88% White; and 49% and 51% had an ECOG performance status 0 and 1, respectively. The median number of prior lines of therapy administered for the treatment of cHL was 4 (range 1 to 12). Eighty-one percent were refractory to at least one prior therapy, including 35% who were refractory to first line therapy. Sixty-one percent of patients had received Auto-SCT, 38% were transplant ineligible; 17% had no prior brentuximab use; and 36% of patients had prior radiation therapy. Disease subtypes were 80% nodular sclerosis, 11% mixed cellularity, 4% lymphocyte-rich and 2% lymphocyte-depleted.

Among KEYNOTE-013 patients, the baseline characteristics were median age 32 years (7% age 65 or older), 58% male, 94% White; and 45% and 55% had an ECOG performance status 0 and 1, respectively. The median number of prior lines of therapy administered for the treatment of cHL was 5 (range 2 to 15). Eighty-seven percent were refractory to at least one prior therapy, including 39% who were refractory to first line therapy. Seventy-four percent of patients had received Auto-SCT, 26% were transplant ineligible, and 42% of patients had prior radiation therapy. Disease subtypes were 97% nodular sclerosis and 3% mixed cellularity.

The major efficacy outcome measures (ORR and CRR) were assessed by blinded independent central review according to the 2007 revised International Working Group (IWG) criteria. Secondary efficacy outcome measures were duration of response, PFS and OS. Response was assessed in KN087 and KN013 every 12 and 8 weeks, respectively, with the first planned post-baseline assessment at week 12. Efficacy results are summarized in Table 8.

**Table 8: Efficacy results in KEYNOTE-087 and KEYNOTE-013**

Endpoint	KEYNOTE-087 <sup>a</sup>	KEYNOTE-013 <sup>b</sup>
	Pembrolizumab 200 mg every 3 weeks n=210	Pembrolizumab 10 mg/kg every 2 weeks n=31
<b>Objective response rate<sup>c</sup></b>		
ORR % (95% CI)	69% (62.3, 75.2)	58% (39.1, 75.5)
Complete Remission	22%	19%
Partial Remission	47%	39%
<b>Response duration<sup>c</sup></b>		
Median in months (range)	11.1 (0.0+, 11.1) <sup>d</sup>	Not reached (0.0+, 26.1+) <sup>e</sup>
% with duration ≥ 6-months	76% <sup>f</sup>	80% <sup>g</sup>
% with duration ≥ 12-months	---	70% <sup>h</sup>
<b>Time to response</b>		
Median in months (range)	2.8 (2.1, 8.8) <sup>d</sup>	2.8 (2.4, 8.6) <sup>e</sup>
<b>PFS<sup>c</sup></b>		
Number (%) of patients with event	70 (33%)	18 (58%)
Median in months (95% CI)	11.3 (10.8, Not reached)	11.4 (4.9, 27.8)
6-month PFS rate	72%	66%
9-month PFS rate	62%	---
12-month PFS rate	---	48%
<b>OS</b>		
Number (%) of patients with event	4 (2%)	4 (13%)
6-month OS rate	99.5%	100%
12-month OS rate	97.6%	87.1%

<sup>a</sup> Median follow-up time of 10.1 months

<sup>b</sup> Median follow-up time of 28.7 months

<sup>c</sup> Assessed by blinded independent central review according to the 2007 revised International Working Group (IWG) criteria by PET CT scans

<sup>d</sup> Based on patients (n=145) with a response by independent review

<sup>e</sup> Based on patients (n=18) with a response by independent review

<sup>f</sup> Based on Kaplan-Meier estimation; includes 31 patients with responses of 6 months or longer

<sup>g</sup> Based on Kaplan-Meier estimation; includes 9 patients with responses of 6 months or longer

<sup>h</sup> Based on Kaplan-Meier estimation; includes 7 patients with responses of 12 months or longer

### Safety and efficacy in elderly patients

Overall, 20 cHL patients ≥ 65 years were treated with pembrolizumab in studies KEYNOTE-087 and KEYNOTE-013. Data from these patients are too limited to draw any conclusion on safety or efficacy in this population.

### Paediatric population

The European Medicines Agency has deferred the obligation to submit the results of studies with pembrolizumab in one or more subsets of the paediatric population in treatment of all conditions included in the category of malignant neoplasms (except nervous system, haematopoietic and lymphoid tissue) (see section 4.2 for information on paediatric use).

## **5.2 Pharmacokinetic properties**

The pharmacokinetics of pembrolizumab was studied in 2,993 patients with metastatic or unresectable melanoma, NSCLC, or carcinoma who received doses in the range of 1 to 10 mg/kg every 2 or 3 weeks.

### Absorption

Pembrolizumab is dosed via the intravenous route and therefore is immediately and completely bioavailable.

### Distribution

Consistent with a limited extravascular distribution, the volume of distribution of pembrolizumab at steady state is small (~7.5 L; CV: 20%). As expected for an antibody, pembrolizumab does not bind to plasma proteins in a specific manner.

### Biotransformation

Pembrolizumab is catabolised through non-specific pathways; metabolism does not contribute to its clearance.

### Elimination

The systemic clearance of pembrolizumab is ~0.2 L/day (CV: 37%) and the terminal half-life ( $t_{1/2}$ ) is ~25 days (CV: 38%).

### Linearity/non-linearity

Exposure to pembrolizumab as expressed by peak concentration ( $C_{max}$ ) or area under the plasma concentration time curve (AUC) increased dose proportionally within the dose range for efficacy. Upon repeated dosing, the clearance of pembrolizumab was found to be independent of time, and systemic accumulation was approximately 2.1-fold when administered every 3 weeks. Near steady-state concentrations of pembrolizumab were achieved by 18 weeks; the median steady-state trough concentrations ( $C_{min}$ ) at 18 weeks were approximately 21 mcg/mL at a dose of 2 mg/kg every 3 weeks and 28 mcg/mL at a dose of 200 mg every 3 weeks. The median area under the concentration-time curve at steady state over 3 weeks ( $AUC_{0-3weeks}$ ) was 658 mcg-day/mL at a dose of 2 mg/kg every 3 weeks and 876 mcg-day/mL at a dose of 200 mg every 3 weeks.

Following administration of pembrolizumab 200 mg every 3 weeks in patients with cHL, the observed median  $C_{min}$  at steady-state was up to 40% higher than that in other tumour types treated with the same dosage; however, the range of trough concentrations is similar. There are no notable differences in median  $C_{max}$  between cHL and other tumour types. Based on available safety data in cHL and other tumour types, these differences are not clinically meaningful.

### Special populations

The effects of various covariates on the pharmacokinetics of pembrolizumab were assessed in population pharmacokinetic analyses. The following factors had no clinically important effect on the clearance of pembrolizumab: age (range 15-94 years), gender, race, mild or moderate renal impairment, mild hepatic impairment and tumour burden. The relationship between body weight and clearance supports the use of either fixed dose or body weight-based dosing to provide adequate and similar control of exposure.

### Renal impairment

The effect of renal impairment on the clearance of pembrolizumab was evaluated by population pharmacokinetic analyses in patients with mild or moderate renal impairment compared to patients with normal renal function. No clinically important differences in the clearance of pembrolizumab were found between patients with mild or moderate renal impairment and patients with normal renal function. Pembrolizumab has not been studied in patients with severe renal impairment.

### Hepatic impairment

The effect of hepatic impairment on the clearance of pembrolizumab was evaluated by population pharmacokinetic analyses in patients with mild hepatic impairment (as defined using the US National Cancer Institute criteria of hepatic dysfunction) compared to patients with normal hepatic function. No clinically important differences in the clearance of pembrolizumab were found between patients

with mild hepatic impairment and normal hepatic function. Pembrolizumab has not been studied in patients with moderate or severe hepatic impairment (see section 4.2).

### **5.3 Preclinical safety data**

The safety of pembrolizumab was evaluated in a 1-month and a 6-month repeat-dose toxicity study in Cynomolgus monkeys administered intravenous doses of 6, 40 or 200 mg/kg once a week in the 1-month study and once every two weeks in the 6-month study, followed by a 4-month treatment-free period. No findings of toxicological significance were observed and the no observed adverse effect level (NOAEL) in both studies was  $\geq 200$  mg/kg, which is 19 times the exposure in humans at the highest clinically tested dose (10 mg/kg).

Animal reproduction studies have not been conducted with pembrolizumab. The PD-1/PD-L1 pathway is thought to be involved in maintaining tolerance to the foetus throughout pregnancy. Blockade of PD-L1 signaling has been shown in murine models of pregnancy to disrupt tolerance to the foetus and to result in an increase in foetal loss.

Animal fertility studies have not been conducted with pembrolizumab. In 1 month and 6 month repeat-dose toxicology studies in monkeys, there were no notable effects in the male and female reproductive organs; however, many animals in these studies were not sexually mature.

## **6. PHARMACEUTICAL PARTICULARS**

### **6.1 List of excipients**

L-histidine  
L-histidine hydrochloride monohydrate  
Sucrose  
Polysorbate 80  
Water for injections

### **6.2 Incompatibilities**

In the absence of compatibility studies, this medicinal product must not be mixed with other medicinal products except those mentioned in section 6.6.

### **6.3 Shelf life**

#### Unopened vial

2 years.

#### After preparation of infusion

From a microbiological point of view, the product, once diluted, should be used immediately. The diluted solution must not be frozen. If not used immediately, chemical and physical in-use stability of KEYTRUDA has been demonstrated for 24 hours at 2°C to 8°C. This 24 hour hold may include up to 6 hours at room temperature (at or below 25°C). If refrigerated, the vials and/or intravenous bags must be allowed to come to room temperature prior to use.

### **6.4 Special precautions for storage**

Store in a refrigerator (2°C – 8°C).

Do not freeze.

Store in the original carton in order to protect from light.

For storage conditions after dilution of the medicinal product, see section 6.3.

## 6.5 Nature and contents of container

4 mL of concentrate in a 10 mL Type I clear glass vial, with a coated grey chlorobutyl stopper and an aluminium seal with a dark blue coloured flip-off cap, containing 100 mg pembrolizumab.

Each carton contains one vial.

## 6.6 Special precautions for disposal and other handling

### Preparation and administration of the infusion

- Do not shake the vial.
- Equilibrate the vial to room temperature (at or below 25°C).
- Prior to dilution, the vial of liquid can be out of refrigeration (temperatures at or below 25°C) for up to 24 hours.
- Parenteral medicinal products should be inspected visually for particulate matter and discolouration prior to administration. The concentrate is a clear to slightly opalescent, colourless to slightly yellow solution. Discard the vial if visible particles are observed.
- Withdraw the required volume up to 4 mL (100 mg) of concentrate and transfer into an intravenous bag containing sodium chloride 9 mg/mL (0.9%) or glucose 50 mg/mL (5%) to prepare a diluted solution with a final concentration ranging from 1 to 10 mg/mL. Each vial contains an excess fill of 0.25 ml (total content per vial 4.25 ml) to ensure the recovery of 4 ml of concentrate. Mix diluted solution by gentle inversion.
- From a microbiological point of view, the product, once diluted, should be used immediately. The diluted solution must not be frozen. If not used immediately, chemical and physical in-use stability of KEYTRUDA has been demonstrated for 24 hours at 2°C to 8°C. This 24 hour hold may include up to 6 hours at room temperature (at or below 25°C). If refrigerated, the vials and/or intravenous bags must be allowed to come to room temperature prior to use. Administer the infusion solution intravenously over 30 minutes using a sterile, non-pyrogenic, low-protein binding 0.2 to 5 µm in-line or add-on filter.
- Do not co-administer other medicinal products through the same infusion line.
- KEYTRUDA is for single use only. Discard any unused portion left in the vial.

Any unused medicinal product or waste material should be disposed of in accordance with local requirements.

## 7. MARKETING AUTHORISATION HOLDER

Merck Sharp & Dohme Limited  
Hertford Road  
Hoddesdon  
Hertfordshire EN11 9BU  
United Kingdom

## 8. MARKETING AUTHORISATION NUMBER(S)

EU/1/15/1024/002



**9. DATE OF FIRST AUTHORISATION/RENEWAL OF THE AUTHORISATION**

Date of first authorisation: 17 July 2015

**10. DATE OF REVISION OF THE TEXT**

Detailed information on this medicinal product is available on the website of the European Medicines Agency <http://www.ema.europa.eu>.

## **ANNEX II**

- A. MANUFACTURER OF THE BIOLOGICAL ACTIVE SUBSTANCE AND MANUFACTURER RESPONSIBLE FOR BATCH RELEASE**
- B. CONDITIONS OR RESTRICTIONS REGARDING SUPPLY AND USE**
- C. OTHER CONDITIONS AND REQUIREMENTS OF THE MARKETING AUTHORISATION**
- D. CONDITIONS OR RESTRICTIONS WITH REGARD TO THE SAFE AND EFFECTIVE USE OF THE MEDICINAL PRODUCT**

**A. MANUFACTURER OF THE BIOLOGICAL ACTIVE SUBSTANCE AND MANUFACTURER RESPONSIBLE FOR BATCH RELEASE**

Name and address of the manufacturer of the biological active substance

MedImmune, LLC Frederick Manufacturing Center (FMC)  
633/636/660 Research Court Frederick  
MD 21703-8619, USA

Boehringer Ingelheim (BIB)  
Pharma GmbH & Co. KG  
Birkendorfer Straße 65  
88397 Biberach an der Riss  
Germany

Name and address of the manufacturer responsible for batch release

Schering-Plough Labo NV  
Industriepark 30, Heist-op-den-Berg  
B-2220, Belgium

**B. CONDITIONS OR RESTRICTIONS REGARDING SUPPLY AND USE**

Medicinal product subject to restricted medical prescription (see Annex I: Summary of Product Characteristics, section 4.2).

**C. OTHER CONDITIONS AND REQUIREMENTS OF THE MARKETING AUTHORISATION**

• **Periodic Safety Update Reports**

The requirements for submission of periodic safety update reports for this medicinal product are set out in the list of Union reference dates (EURD list) provided for under Article 107c(7) of Directive 2001/83/EC and any subsequent updates published on the European medicines web-portal.

The marketing authorisation holder shall submit the first periodic safety update report for this product within 6 months following authorisation.

**D. CONDITIONS OR RESTRICTIONS WITH REGARD TO THE SAFE AND EFFECTIVE USE OF THE MEDICINAL PRODUCT**

• **Risk Management Plan (RMP)**

The MAH shall perform the required pharmacovigilance activities and interventions detailed in the agreed RMP presented in Module 1.8.2 of the Marketing Authorisation and any agreed subsequent updates of the RMP.

An updated RMP should be submitted:

- At the request of the European Medicines Agency;

- Whenever the risk management system is modified, especially as the result of new information being received that may lead to a significant change to the benefit/risk profile or as the result of an important (pharmacovigilance or risk minimisation) milestone being reached.
- **Additional risk minimisation measures**

Prior to launch of KEYTRUDA in each Member State the MAH must agree about the content and format of the educational programme, including communication media, distribution modalities, and any other aspects of the programme, with the National Competent Authority.

The educational programme is aimed at increasing the awareness of physicians about the potential:

- immune-mediated adverse events
- infusion-related reactions

associated with KEYTRUDA use and on how to manage them and to enhance the awareness of patients and/or their caregivers on the signs and symptoms relevant to the early recognition/identification of those adverse events.

The MAH shall ensure that in each Member State where KEYTRUDA is marketed, all healthcare professionals and patients/caregivers who are expected to prescribe and use KEYTRUDA have access to/are provided with the following educational package:

- Physician educational material
- Patient educational material

**The physician educational material** should contain:

- The Summary of Product Characteristics
- Healthcare professional Frequently Asked Questions (FAQ) Brochure

The healthcare professional FAQ Brochure shall contain the following key elements:

List of important immune-related adverse reactions (irARs) and their symptoms including precautions and treatment, as outlined in section 4.4 of the Summary of Product Characteristics:

- irARs
    - Pneumonitis
    - Colitis
    - Hepatitis
    - Nephritis
    - Severe endocrinopathies, including hypophysitis (including hypopituitarism and secondary adrenal insufficiency), type 1 diabetes mellitus, diabetic ketoacidosis, hypothyroidism, hyperthyroidism and thyroiditis
  - Other irARs including: uveitis, myositis, pancreatitis, severe skin reactions and Guillain Barré syndrome
  - Potential risk of “Severe complications of allogeneic stem cell transplant in patients who have previously received pembrolizumab for hematologic malignancies”
  - Infusion-related reactions.
- Details on how to minimise the safety concerns through appropriate monitoring and management
  - Reminder to distribute the Patient Information Brochure and Patient Alert Card.

**The patient educational material** should contain:

- Patient Information Brochure
- The Patient Alert Card

The Patient Information Brochure and Patient Alert Card shall contain the following key elements:

- Description of the main signs or symptoms of the irARs and the importance of notifying their treating physician immediately if symptoms occur
- The importance of not attempting to self-treat any symptoms without consulting their healthcare professional first
- Information that patients treated with pembrolizumab who then go on to stem cell transplant that uses donor cells (allogenic) can experience transplant complications, that can be severe and can lead to death, and that their doctor will monitor them for these complications. These patients should inform their transplant physicians that they have received pembrolizumab in the past.
- The importance of carrying the Patient Alert Card at all times and to show it at all medical visits to healthcare professionals other than the prescriber (e.g. emergency healthcare professionals).

The Card reminds patients about key symptoms that need to be reported immediately to the physician/nurse. It also contains prompts to enter contact details of the physician and to alert other physicians that the patient is treated with KEYTRUDA

- **Obligation to conduct post-authorisation measures**

The MAH shall complete, within the stated timeframe, the below measures:

Description	Due date
1. Post-authorisation efficacy study (PAES): The MAH should submit the final study report for study P002: Randomized, Phase II Study of MK-3475 versus Chemotherapy in Patients with Advanced Melanoma – Final Study Report	1Q 2017
2. Post-authorisation efficacy study (PAES): The MAH should submit the final study report for study P006: A Multicenter, Randomized, Controlled, Three-Arm, Phase III Study to Evaluate the Safety and Efficacy of Two Dosing Schedules of MK-3475 Compared to Ipilimumab in Patients with Advanced Melanoma – Final Study Report	1Q 2017
3. Post-authorisation efficacy study (PAES): In order to confirm the benefit in BRAF V600 mutant and in PD-L1 negative patient subgroups at the recommended dose, the MAH should provide updated analyses from Study P001 and P002: <ul style="list-style-type: none"> <li>• Updated efficacy data in subgroups comparing 2 vs 10 mg/kg Q3W from the P002 final analysis.</li> <li>• Efficacy data in subgroups comparing the 2 vs 10 mg/kg Q3W from P001, using the data cut-off date of 18-Oct-2014 from Parts B2 and D of P001 by dose level.</li> </ul>	1Q 2017 3Q 2015
4. Post-authorisation efficacy study (PAES): The MAH should submit the final study report for study P087, A Phase II Clinical Trial of MK-3475 (Pembrolizumab) in Subjects with Relapsed or Refractory (R/R) Classical Hodgkin Lymphoma (cHL) – Final Study Report	3Q 2021
5. Post-authorisation efficacy study (PAES): The MAH should submit the final study report for study P013, A Phase Ib Multi-Cohort Trial of MK-3475 (pembrolizumab) in Subjects with Hematologic Malignancies – Final Study Report	1Q 2019

Description	Due date
<p>6. Post-authorisation efficacy study (PAES): The MAH should submit the final study report for study P204: A Phase III, Randomized, Open-label, Clinical Trial to Compare Pembrolizumab with Brentuximab Vedotin in Subjects with Relapsed or Refractory Classical Hodgkin Lymphoma – Final Study Report</p>	<p>2Q 2021</p>
<p>7. The value of biomarkers to predict the efficacy of pembrolizumab should be further explored, specifically:</p> <p>Although PD-L1 status is predictive of response in advanced melanoma patients, durable responses have been observed in PD-L1 negative patients. Additional biomarkers other than PD-L1 expression status by Immunohistochemistry (IHC) (e.g. PD-L2, RNA signature, etc.) predictive of pembrolizumab efficacy should be investigated together with more information regarding the pattern of expression of PD-L1 obtained in the ongoing melanoma studies (P001, P002 and P006) and NSCLC studies (P001, P010, P024 and P042):</p> <ul style="list-style-type: none"> <li>• Comparison between PD-L1 IHC staining in archival tissue vs newly obtained (melanoma studies only)</li> <li>• Comparison of PD-L1 IHC between pre and post treatment tumour tissues (melanoma studies only)</li> <li>• Data on the Nanostring RNA gene signature</li> <li>• IHC staining for PD-L2</li> <li>• Data on RNA and proteomic serum profiling</li> <li>• Data on Immune cell profiling (peripheral blood) (melanoma studies only)</li> </ul>	<p>1Q 2017 2Q 2020</p>

**ANNEX III**  
**LABELLING AND PACKAGE LEAFLET**

## **A. LABELLING**



**PARTICULARS TO APPEAR ON THE OUTER PACKAGING**

**OUTER CARTON**

**1. NAME OF THE MEDICINAL PRODUCT**

KEYTRUDA 50 mg powder for concentrate for solution for infusion  
pembrolizumab

**2. STATEMENT OF ACTIVE SUBSTANCE(S)**

One vial of powder contains 50 mg of pembrolizumab. After reconstitution, 1 mL of concentrate contains 25 mg of pembrolizumab.

**3. LIST OF EXCIPIENTS**

Excipients: L-histidine, L-histidine hydrochloride monohydrate, sucrose, polysorbate 80.

**4. PHARMACEUTICAL FORM AND CONTENTS**

powder for concentrate for solution for infusion  
1 vial

**5. METHOD AND ROUTE(S) OF ADMINISTRATION**

Intravenous use.  
For single use only.  
Read the package leaflet before use.

**6. SPECIAL WARNING THAT THE MEDICINAL PRODUCT MUST BE STORED OUT OF THE SIGHT AND REACH OF CHILDREN**

Keep out of the sight and reach of children.

**7. OTHER SPECIAL WARNING(S), IF NECESSARY**

**8. EXPIRY DATE**

EXP

The reconstituted vials and/or diluted intravenous bags may be stored for a cumulative time of up to 24 hours in a refrigerator (2°C – 8°C).

**9. SPECIAL STORAGE CONDITIONS**

Store in a refrigerator (2°C – 8°C).

**10. SPECIAL PRECAUTIONS FOR DISPOSAL OF UNUSED MEDICINAL PRODUCTS OR WASTE MATERIALS DERIVED FROM SUCH MEDICINAL PRODUCTS, IF APPROPRIATE**

**11. NAME AND ADDRESS OF THE MARKETING AUTHORISATION HOLDER**

Merck Sharp &Dohme Limited  
Hertford Road, Hoddesdon  
Hertfordshire EN11 9BU  
United Kingdom

**12. MARKETING AUTHORISATION NUMBER(S)**

EU/1/15/1024/001 (1 vial)

**13. BATCH NUMBER**

Lot

**14. GENERAL CLASSIFICATION FOR SUPPLY**

**15. INSTRUCTIONS ON USE**

**16. INFORMATION IN BRAILLE**

Justification for not including Braille accepted

**17. UNIQUE IDENTIFIER – 2D BARCODE**

2D barcode carrying the unique identifier included.

**18. UNIQUE IDENTIFIER – HUMAN READABLE DATA**

PC:  
SN:  
NN:

**MINIMUM PARTICULARS TO APPEAR ON SMALL IMMEDIATE PACKAGING UNITS**

**VIAL**

**1. NAME OF THE MEDICINAL PRODUCT AND ROUTE(S) OF ADMINISTRATION**

KEYTRUDA 50 mg powder for concentrate for solution for infusion  
pembrolizumab  
Intravenous use  
IV

**2. METHOD OF ADMINISTRATION**

**3. EXPIRY DATE**

EXP

**4. BATCH NUMBER**

Lot

**5. CONTENTS BY WEIGHT, BY VOLUME OR BY UNIT**

**6. OTHER**

**PARTICULARS TO APPEAR ON THE OUTER PACKAGING**

**OUTER CARTON**

**1. NAME OF THE MEDICINAL PRODUCT**

KEYTRUDA 25 mg/mL concentrate for solution for infusion  
pembrolizumab  
100 mg/4 mL

**2. STATEMENT OF ACTIVE SUBSTANCE(S)**

One vial of 4 mL contains 100 mg of pembrolizumab. Each mL of concentrate contains 25 mg of pembrolizumab.

**3. LIST OF EXCIPIENTS**

Excipients: L-histidine, L-histidine hydrochloride monohydrate, sucrose, polysorbate 80, water for injections.

**4. PHARMACEUTICAL FORM AND CONTENTS**

Concentrate for solution for infusion  
1 vial

**5. METHOD AND ROUTE(S) OF ADMINISTRATION**

Intravenous use after dilution.  
For single use only.  
Read the package leaflet before use.

**6. SPECIAL WARNING THAT THE MEDICINAL PRODUCT MUST BE STORED OUT OF THE SIGHT AND REACH OF CHILDREN**

Keep out of the sight and reach of children.

**7. OTHER SPECIAL WARNING(S), IF NECESSARY**

Do not shake.

**8. EXPIRY DATE**

EXP

The diluted solution may be stored for up to 24 hours in a refrigerator (2°C – 8°C).

**9. SPECIAL STORAGE CONDITIONS**

Store in a refrigerator (2°C – 8°C).

Do not Freeze.

Store in the original carton in order to protect from light.

**10. SPECIAL PRECAUTIONS FOR DISPOSAL OF UNUSED MEDICINAL PRODUCTS OR WASTE MATERIALS DERIVED FROM SUCH MEDICINAL PRODUCTS, IF APPROPRIATE**

**11. NAME AND ADDRESS OF THE MARKETING AUTHORISATION HOLDER**

Merck Sharp &Dohme Limited  
Hertford Road, Hoddesdon  
Hertfordshire EN11 9BU  
United Kingdom

**12. MARKETING AUTHORISATION NUMBER(S)**

EU/1/15/1024/002 (1 vial)

**13. BATCH NUMBER**

Lot

**14. GENERAL CLASSIFICATION FOR SUPPLY**

**15. INSTRUCTIONS ON USE**

**16. INFORMATION IN BRAILLE**

Justification for not including Braille accepted

**17. UNIQUE IDENTIFIER – 2D BARCODE**

2D barcode carrying the unique identifier included.

**18. UNIQUE IDENTIFIER – HUMAN READABLE DATA**

PC:

SN:  
NN:

**MINIMUM PARTICULARS TO APPEAR ON SMALL IMMEDIATE PACKAGING UNITS**

**VIAL**

**1. NAME OF THE MEDICINAL PRODUCT AND ROUTE(S) OF ADMINISTRATION**

KEYTRUDA 25 mg/mL concentrate for solution for infusion  
pembrolizumab  
100 mg/4 mL  
IV

**2. METHOD OF ADMINISTRATION**

**3. EXPIRY DATE**

EXP

**4. BATCH NUMBER**

Lot

**5. CONTENTS BY WEIGHT, BY VOLUME OR BY UNIT**

**6. OTHER**

## **B. PACKAGE LEAFLET**



## Package leaflet: Information for the patient

### KEYTRUDA 50 mg powder for concentrate for solution for infusion pembrolizumab

▼ This medicine is subject to additional monitoring. This will allow quick identification of new safety information. You can help by reporting any side effects you may get. See the end of section 4 for how to report side effects.

**Read all of this leaflet carefully before you are given this medicine because it contains important information for you.**

- Keep this leaflet. You may need to read it again.
- It is important that you keep the Alert Card with you during treatment.
- If you have any further questions, ask your doctor.
- If you get any side effects, talk to your doctor. This includes any possible side effects not listed in this leaflet. See section 4.

#### What is in this leaflet

1. What KEYTRUDA is and what it is used for
2. What you need to know before you are given KEYTRUDA
3. How you are given KEYTRUDA
4. Possible side effects
5. How to store KEYTRUDA
6. Contents of the pack and other information

#### 1. What KEYTRUDA is and what it is used for

KEYTRUDA contains the active substance pembrolizumab, which is a monoclonal antibody. KEYTRUDA works by helping your immune system fight your cancer.

KEYTRUDA is used in adults to treat:

- a kind of skin cancer called melanoma
- a kind of lung cancer called non-small cell lung cancer
- a kind of cancer called classical Hodgkin lymphoma.

People get KEYTRUDA when their cancer has spread or cannot be taken out by surgery.

#### 2. What you need to know before you are given KEYTRUDA

You should not be given KEYTRUDA:

- if you are allergic to pembrolizumab or any of the other ingredients of this medicine (listed in section 6 “Contents of the pack and other information”). Talk to your doctor if you are not sure.

#### Warnings and precautions

Talk to your doctor or nurse before receiving KEYTRUDA.

Before you get KEYTRUDA, tell your doctor if you:

- have an autoimmune disease (a condition where the body attacks its own cells)
- have pneumonia or inflammation of your lungs (called pneumonitis)

- were previously given ipilimumab, another medicine for treating melanoma, and experienced serious side effects because of that medicine
- had an allergic reaction to other monoclonal antibody therapies
- have or have had chronic viral infection of the liver, including hepatitis B (HBV) or hepatitis C (HCV)
- have human immunodeficiency virus (HIV) infection or acquired immune deficiency syndrome (AIDS)
- have liver damage or have had a liver transplant
- have kidney damage or have had a kidney transplant.

When you get KEYTRUDA, you can have some serious side effects. You may experience more than one side effect at the same time.

If you have any of the following conditions, call or see your doctor right away. Your doctor may give you other medicines in order to prevent more severe complications and reduce your symptoms. Your doctor may withhold the next dose of KEYTRUDA or stop your treatment with KEYTRUDA.

- inflammation of the lungs, which may include shortness of breath, chest pain or coughing
- inflammation of the intestines, which may include diarrhoea or more bowel movements than usual, black, tarry, sticky stools or stools with blood or mucus, severe stomach pain or tenderness, nausea, vomiting
- inflammation of the liver, which may include nausea or vomiting, feeling less hungry, pain on the right side of stomach, yellowing of skin or whites of eyes, dark urine or bleeding or bruising more easily than normal
- inflammation of the kidneys, which may include changes in the amount or colour of your urine
- inflammation of hormone glands (especially the thyroid, pituitary and adrenal glands), which may include rapid heartbeat, weight loss, increased sweating, weight gain, hair loss, feeling cold, constipation, deeper voice, muscle aches, dizziness or fainting, headaches that will not go away or unusual headache
- type 1 diabetes, which may include feeling more hungry or thirsty than usual, need to urinate more often or weight loss
- inflammation of the eyes, which may include changes in eyesight
- inflammation in the muscles, which may include muscle pain or weakness
- inflammation of the pancreas, which may include abdominal pain, nausea and vomiting
- inflammation of the skin, which may include rash
- infusion reactions, which may include shortness of breath, itching or rash, dizziness or fever

**Complications of stem cell transplant that uses donor stem cells (allogeneic) after treatment with KEYTRUDA.** These complications can be severe and can lead to death. Your healthcare provider will monitor you for signs of complications if you have an allogeneic stem cell transplant. If you are having a stem cell transplant, tell your transplant doctor that you have received pembrolizumab in the past.

### **Children and adolescents**

KEYTRUDA should not be used in children and adolescents below 18 years of age.

### **Other medicines and KEYTRUDA**

Tell your doctor

- If you are taking other medicines that make your immune system weak. Examples of these may include corticosteroids, such as prednisone. These medicines may interfere with the effect of KEYTRUDA. However, once you are treated with KEYTRUDA, your doctor may give you corticosteroids to reduce the side-effects that you may have with KEYTRUDA.
- If you are taking, have recently taken or might take any other medicines.

Pregnancy

- You must not use KEYTRUDA if you are pregnant unless your doctor specifically recommends it.
- If you are pregnant, think you may be pregnant or are planning to have a baby, tell your doctor.
- KEYTRUDA can cause harm or death to your unborn baby.
- If you are a woman who could become pregnant, you must use adequate birth control while you are being treated with KEYTRUDA and for at least 4 months after your last dose.

#### Breast-feeding

- If you are breast-feeding, tell your doctor.
- Do not breast-feed while taking KEYTRUDA.
- It is not known if KEYTRUDA passes into your breast milk.

#### Driving and using machines

Do not drive or use machines after you have been given KEYTRUDA unless you are sure you are feeling well. Feeling tired or weak is a very common side effect of KEYTRUDA. This can affect your ability to drive or to use machines.

### 3. How you are given KEYTRUDA

KEYTRUDA will be given to you in a hospital or clinic under the supervision of a doctor experienced in cancer treatment.

- Your doctor will give you KEYTRUDA through an infusion into your vein (IV) for about 30 minutes, every 3 weeks.
- Your doctor will decide how many treatments you need.

The recommended dose is:

- 200 mg of pembrolizumab if you have non-small cell lung cancer that has not been previously treated with chemotherapy or classical Hodgkin lymphoma.
- 2 mg of pembrolizumab per kilogram of your body weight if you have melanoma or if you have non-small cell lung cancer that has been previously treated with chemotherapy.

#### If you miss an appointment to get KEYTRUDA

- Call your doctor right away to reschedule your appointment.
- It is very important that you do not miss a dose of this medicine.

#### If you stop receiving KEYTRUDA

Stopping your treatment may stop the effect of the medicine. Do not stop treatment with KEYTRUDA unless you have discussed this with your doctor.

If you have any further questions about your treatment, ask your doctor.

You will also find this information in the Patient Alert Card you have been given by your doctor. It is important that you keep this Alert Card and show it to your partner or caregivers.

### 4. Possible side effects

Like all medicines, this medicine can cause side effects, although not everybody gets them.

When you get KEYTRUDA, you can have some serious side effects. See section 2.

The following side effects have been reported in clinical trials:

#### Very common (may affect more than 1 in 10 people)

- diarrhoea; nausea

- itching; skin rash
- feeling tired

**Common (may affect up to 1 in 10 people)**

- joint pain
- decrease in the number of red blood cells
- thyroid gland problems; hot flush
- feeling less hungry
- headache; dizziness; change in your sense of taste
- inflammation of the lungs; shortness of breath; cough
- inflammation of the intestines; dry mouth
- dry eye
- stomach pain; constipation; vomiting
- red raised rash sometimes with blisters; patches of skin which have lost colour; dry, itchy skin
- muscle pain, aches or tenderness; pain in the muscles and bones; pain in arms or legs; joint pain with swelling
- swelling; unusual tiredness or weakness; chills; flu-like illness; fever
- increased liver enzyme levels in the blood; abnormal kidney function test
- reaction related to the infusion of the medicine

**Uncommon (may affect up to 1 in 100 people)**

- a decreased number of white blood cells (neutrophils, leukocytes, lymphocytes and eosinophils); decrease in the number of platelets (bruising or bleeding more easily)
- inflammation of the pituitary gland situated at the base of the brain; decreased secretion of hormones produced by the adrenal glands; inflammation of the thyroid
- type 1 diabetes; decreased sodium, potassium and calcium in the blood
- trouble sleeping
- seizure; lack of energy; inflammation of the nerves causing numbness, weakness, tingling or burning pain of the arms and legs
- inflammation of the eyes; eye pain, irritation, itchiness or redness; uncomfortable sensitivity to light; seeing spots
- high blood pressure
- inflammation of the pancreas
- inflammation of the liver
- thickened, sometimes scaly, skin growth; hair loss; inflammation of the skin; acne-like skin problem; hair colour changes; small skin bumps, lumps or sores
- inflammation of the sheath that surrounds tendons
- inflammation of the kidneys
- increased level of amylase, an enzyme that breaks down starch; increased calcium in the blood

**Rare (may affect up to 1 in 1,000 people)**

- inflammation response against platelets or red blood cells
- a temporary inflammation of the nerves that cause pain, weakness, and paralysis in the extremities; a condition in which the muscles become weak and tire easily
- a hole in the small intestines
- tender red bumps under the skin

**Reporting of side effects**

If you get any side effects, talk to your doctor. This includes any possible side effects not listed in this leaflet. You can also report side effects directly via the national reporting system listed in [Appendix V](#). By reporting side effects you can help provide more information on the safety of this medicine.

## 5. How to store KEYTRUDA

Keep this medicine out of the sight and reach of children.

Do not use this medicine after the expiry date which is stated on the carton and vial label after EXP. The expiry date refers to the last day of that month.

Store in a refrigerator (2°C – 8°C).

From a microbiological point of view, the reconstituted or diluted solution should be used immediately. The reconstituted or diluted solution must not be frozen. If not used immediately, chemical and physical in-use stability of KEYTRUDA has been demonstrated for 24 hours at 2°C to 8°C. This 24 hour total hold from reconstitution may include up to 6 hours at room temperature (at or below 25°C). If refrigerated, the vials and/or intravenous bags must be allowed to come to room temperature prior to use.

Do not store any unused portion of the infusion solution for reuse. Any unused medicine or waste material should be disposed of in accordance with local requirements.

## 6. Contents of the pack and other information

### What KEYTRUDA contains

The active substance is pembrolizumab. One vial contains 50 mg of pembrolizumab.

After reconstitution, 1 mL of concentrate contains 25 mg of pembrolizumab.

The other ingredients are L-histidine, L-histidine hydrochloride monohydrate, sucrose and polysorbate 80.

### What KEYTRUDA looks like and contents of the pack

KEYTRUDA is a white to off-white lyophilised powder.

It is available in cartons containing one glass vial.

### Marketing Authorisation Holder

Merck Sharp & Dohme Limited  
Hertford Road  
Hoddesdon  
Hertfordshire EN11 9BU  
United Kingdom

### Manufacturer

Schering-Plough Labo NV  
Industriepark 30  
B-2220 Heist-op-den-Berg  
Belgium

For any information about this medicine, please contact the local representative of the Marketing Authorisation Holder:

### België/Belgique/Belgien

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**Other sources of information**

Detailed information on this medicine is available on the European Medicines Agency web site:  
<http://www.ema.europa.eu>.

**The following information is intended for healthcare professionals only:**

## Preparation and administration

- Prior to reconstitution, the vial of lyophilised powder can be out of refrigeration (temperatures at or below 25°C) for up to 24 hours.
- Aseptically add 2.3 mL of water for injections to yield a 25 mg/mL (pH 5.2-5.8) solution of KEYTRUDA. Each vial contains an excess fill of 10 mg (0.4 mL) to ensure the recovery of 50 mg of KEYTRUDA per vial. After reconstitution, 1 mL of concentrate contains 25 mg of pembrolizumab.
- To avoid foaming, deliver the water along the walls of the vial and not directly on the lyophilised powder.
- Slowly swirl the vial to allow reconstitution of the lyophilised powder. Allow up to 5 minutes for the bubbles to clear. Do not shake the vial.
- Parenteral medicinal products should be inspected visually for particulate matter and discolouration prior to administration. Reconstituted KEYTRUDA is a clear to slightly opalescent, colourless to slightly yellow solution. Discard the vial if visible particles are observed.
- Withdraw the required volume up to 2 mL (50 mg) of KEYTRUDA and transfer into an intravenous bag containing sodium chloride 9 mg/mL (0.9%) or glucose 50 mg/mL (5%) to prepare a diluted solution with a final concentration ranging from 1 to 10 mg/mL. Mix diluted solution by gentle inversion.
- From a microbiological point of view, the reconstituted or diluted solution should be used immediately. The reconstituted or diluted solution must not be frozen. If not used immediately, chemical and physical in-use stability of KEYTRUDA has been demonstrated for 24 hours at 2°C to 8°C. This 24 hour total hold from reconstitution may include up to 6 hours at room temperature (at or below 25°C). If refrigerated, the vials and/or intravenous bags must be allowed to come to room temperature prior to use. Administer the infusion solution

intravenously over 30 minutes using a sterile, non-pyrogenic, low-protein binding 0.2 to 5  $\mu\text{m}$  in-line or add-on filter.

- Do not co-administer other medicinal products through the same infusion line.
- KEYTRUDA is for single use only. Discard any unused portion left in the vial.

Any unused medicinal product or waste material should be disposed of in accordance with local requirements.



## Package leaflet: Information for the patient

### KEYTRUDA 25 mg/mL concentrate for solution for infusion pembrolizumab

▼ This medicine is subject to additional monitoring. This will allow quick identification of new safety information. You can help by reporting any side effects you may get. See the end of section 4 for how to report side effects.

**Read all of this leaflet carefully before you are given this medicine because it contains important information for you.**

- Keep this leaflet. You may need to read it again.
- It is important that you keep the Alert Card with you during treatment.
- If you have any further questions, ask your doctor.
- If you get any side effects, talk to your doctor. This includes any possible side effects not listed in this leaflet. See section 4.

#### What is in this leaflet

1. What KEYTRUDA is and what it is used for
2. What you need to know before you are given KEYTRUDA
3. How you are given KEYTRUDA
4. Possible side effects
5. How to store KEYTRUDA
6. Contents of the pack and other information

#### 1. What KEYTRUDA is and what it is used for

KEYTRUDA contains the active substance pembrolizumab, which is a monoclonal antibody. KEYTRUDA works by helping your immune system fight your cancer.

KEYTRUDA is used in adults to treat:

- a kind of skin cancer called melanoma
- a kind of lung cancer called non-small cell lung cancer
- a kind of cancer called classical Hodgkin lymphoma.

People get KEYTRUDA when their cancer has spread or cannot be taken out by surgery.

#### 2. What you need to know before you are given KEYTRUDA

You should not be given KEYTRUDA:

- if you are allergic to pembrolizumab or any of the other ingredients of this medicine (listed in section 6 “Contents of the pack and other information”). Talk to your doctor if you are not sure.

#### Warnings and precautions

Talk to your doctor or nurse before receiving KEYTRUDA.

Before you get KEYTRUDA, tell your doctor if you:

- have an autoimmune disease (a condition where the body attacks its own cells)
- have pneumonia or inflammation of your lungs (called pneumonitis)

- were previously given ipilimumab, another medicine for treating melanoma, and experienced serious side effects because of that medicine
- had an allergic reaction to other monoclonal antibody therapies
- have or have had chronic viral infection of the liver, including hepatitis B (HBV) or hepatitis C (HCV)
- have human immunodeficiency virus (HIV) infection or acquired immune deficiency syndrome (AIDS)
- have liver damage or have had a liver transplant
- have kidney damage or have had a kidney transplant.

When you get KEYTRUDA, you can have some serious side effects. You may experience more than one side effect at the same time.

If you have any of the following conditions, call or see your doctor right away. Your doctor may give you other medicines in order to prevent more severe complications and reduce your symptoms. Your doctor may withhold the next dose of KEYTRUDA or stop your treatment with KEYTRUDA.

- inflammation of the lungs, which may include shortness of breath, chest pain or coughing
- inflammation of the intestines, which may include diarrhoea or more bowel movements than usual, black, tarry, sticky stools or stools with blood or mucus, severe stomach pain or tenderness, nausea, vomiting
- inflammation of the liver, which may include nausea or vomiting, feeling less hungry, pain on the right side of stomach, yellowing of skin or whites of eyes, dark urine or bleeding or bruising more easily than normal
- inflammation of the kidneys, which may include changes in the amount or colour of your urine
- inflammation of hormone glands (especially the thyroid, pituitary and adrenal glands), which may include rapid heartbeat, weight loss, increased sweating, weight gain, hair loss, feeling cold, constipation, deeper voice, muscle aches, dizziness or fainting, headaches that will not go away or unusual headache
- type 1 diabetes, which may include feeling more hungry or thirsty than usual, need to urinate more often or weight loss
- inflammation of the eyes, which may include changes in eyesight
- inflammation in the muscles, which may include muscle pain or weakness
- inflammation of the pancreas, which may include abdominal pain, nausea and vomiting
- inflammation of the skin, which may include rash
- infusion reactions, which may include shortness of breath, itching or rash, dizziness or fever

**Complications of stem cell transplant that uses donor stem cells (allogeneic) after treatment with KEYTRUDA.** These complications can be severe and can lead to death. Your healthcare provider will monitor you for signs of complications if you have an allogeneic stem cell transplant. If you are having a stem cell transplant, tell your transplant doctor that you have received pembrolizumab in the past.

### **Children and adolescents**

KEYTRUDA should not be used in children and adolescents below 18 years of age.

### **Other medicines and KEYTRUDA**

Tell your doctor

- If you are taking other medicines that make your immune system weak. Examples of these may include corticosteroids, such as prednisone. These medicines may interfere with the effect of KEYTRUDA. However, once you are treated with KEYTRUDA, your doctor may give you corticosteroids to reduce the side-effects that you may have with KEYTRUDA.
- If you are taking, have recently taken or might take any other medicines.

Pregnancy

- You must not use KEYTRUDA if you are pregnant unless your doctor specifically recommends it.
- If you are pregnant, think you may be pregnant or are planning to have a baby, tell your doctor.
- KEYTRUDA can cause harm or death to your unborn baby.
- If you are a woman who could become pregnant, you must use adequate birth control while you are being treated with KEYTRUDA and for at least 4 months after your last dose.

#### Breast-feeding

- If you are breast-feeding, tell your doctor.
- Do not breast-feed while taking KEYTRUDA.
- It is not known if KEYTRUDA passes into your breast milk.

#### Driving and using machines

Do not drive or use machines after you have been given KEYTRUDA unless you are sure you are feeling well. Feeling tired or weak is a very common side effect of KEYTRUDA. This can affect your ability to drive or to use machines.

### 3. How you are given KEYTRUDA

KEYTRUDA will be given to you in a hospital or clinic under the supervision of a doctor experienced in cancer treatment.

- Your doctor will give you KEYTRUDA through an infusion into your vein (IV) for about 30 minutes, every 3 weeks.
- Your doctor will decide how many treatments you need.

The recommended dose is:

- 200 mg of pembrolizumab if you have non-small cell lung cancer that has not been previously treated with chemotherapy or classical Hodgkin lymphoma.
- 2 mg of pembrolizumab per kilogram of your body weight if you have melanoma or if you have non-small cell lung cancer that has been previously treated with chemotherapy.

#### If you miss an appointment to get KEYTRUDA

- Call your doctor right away to reschedule your appointment.
- It is very important that you do not miss a dose of this medicine.

#### If you stop receiving KEYTRUDA

Stopping your treatment may stop the effect of the medicine. Do not stop treatment with KEYTRUDA unless you have discussed this with your doctor.

If you have any further questions about your treatment, ask your doctor.

You will also find this information in the Patient Alert Card you have been given by your doctor. It is important that you keep this Alert Card and show it to your partner or caregivers.

### 4. Possible side effects

Like all medicines, this medicine can cause side effects, although not everybody gets them.

When you get KEYTRUDA, you can have some serious side effects. See section 2.

The following side effects have been reported in clinical trials:

#### Very common (may affect more than 1 in 10 people)

- diarrhoea; nausea

- itching; skin rash
- feeling tired

**Common (may affect up to 1 in 10 people)**

- joint pain
- decrease in the number of red blood cells
- thyroid gland problems; hot flush
- feeling less hungry
- headache; dizziness; change in your sense of taste
- inflammation of the lungs; shortness of breath; cough
- inflammation of the intestines; dry mouth
- dry eye
- stomach pain; constipation; vomiting
- red raised rash sometimes with blisters; patches of skin which have lost colour; dry, itchy skin
- muscle pain, aches or tenderness; pain in the muscles and bones; pain in arms or legs; joint pain with swelling
- swelling; unusual tiredness or weakness; chills; flu-like illness; fever
- increased liver enzyme levels in the blood; abnormal kidney function test
- reaction related to the infusion of the medicine

**Uncommon (may affect up to 1 in 100 people)**

- a decreased number of white blood cells (neutrophils, leukocytes, lymphocytes and eosinophils); decrease in the number of platelets (bruising or bleeding more easily)
- inflammation of the pituitary gland situated at the base of the brain; decreased secretion of hormones produced by the adrenal glands; inflammation of the thyroid
- type 1 diabetes; decreased sodium, potassium and calcium in the blood
- trouble sleeping
- seizure; lack of energy; inflammation of the nerves causing numbness, weakness, tingling or burning pain of the arms and legs
- inflammation of the eyes; eye pain, irritation, itchiness or redness; uncomfortable sensitivity to light; seeing spots
- high blood pressure
- inflammation of the pancreas
- inflammation of the liver
- thickened, sometimes scaly, skin growth; hair loss; inflammation of the skin; acne-like skin problem; hair colour changes; small skin bumps, lumps or sores
- inflammation of the sheath that surrounds tendons
- inflammation of the kidneys
- increased level of amylase, an enzyme that breaks down starch; increased calcium in the blood

**Rare (may affect up to 1 in 1,000 people)**

- inflammation response against platelets or red blood cells
- a temporary inflammation of the nerves that cause pain, weakness, and paralysis in the extremities; a condition in which the muscles become weak and tire easily
- a hole in the small intestines
- tender red bumps under the skin

**Reporting of side effects**

If you get any side effects, talk to your doctor. This includes any possible side effects not listed in this leaflet. You can also report side effects directly via the national reporting system listed in [Appendix V](#). By reporting side effects you can help provide more information on the safety of this medicine.

## 5. How to store KEYTRUDA

Keep this medicine out of the sight and reach of children.

Do not use this medicine after the expiry date which is stated on the carton and vial label after EXP. The expiry date refers to the last day of that month.

Store in a refrigerator (2°C – 8°C).

Do not freeze.

Store in the original carton in order to protect from light.

From a microbiological point of view, the product, once diluted, should be used immediately. The diluted solution must not be frozen. If not used immediately, chemical and physical in-use stability of KEYTRUDA has been demonstrated for 24 hours at 2°C to 8°C. This 24 hour hold may include up to 6 hours at room temperature (at or below 25°C). If refrigerated, the vials and/or intravenous bags must be allowed to come to room temperature prior to use.

Do not store any unused portion of the infusion solution for reuse. Any unused medicine or waste material should be disposed of in accordance with local requirements.

## 6. Contents of the pack and other information

### What KEYTRUDA contains

The active substance is pembrolizumab.

One vial of 4 mL contains 100 mg of pembrolizumab.

Each mL of concentrate contains 25 mg of pembrolizumab.

The other ingredients are L-histidine, L-histidine hydrochloride monohydrate, sucrose, polysorbate 80 and water for injections.

### What KEYTRUDA looks like and contents of the pack

KEYTRUDA is a clear to slightly opalescent, colourless to slightly yellow solution, pH 5.2 – 5.8.

It is available in cartons containing one glass vial.

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**This leaflet was last revised in**

**Other sources of information**

Detailed information on this medicine is available on the European Medicines Agency web site:  
<http://www.ema.europa.eu>.

**The following information is intended for healthcare professionals only:**

## Preparation and administration of the infusion

- Do not shake the vial.
- Equilibrate the vial to room temperature (at or below 25°C).
- Prior to dilution, the vial of liquid can be out of refrigeration (temperatures at or below 25°C) for up to 24 hours.
- Parenteral medicinal products should be inspected visually for particulate matter and discoloration prior to administration. The concentrate is a clear to slightly opalescent, colourless to slightly yellow solution. Discard the vial if visible particles are observed.
- Withdraw the required volume up to 4 mL (100 mg) of concentrate and transfer into an intravenous bag containing sodium chloride 9 mg/mL (0.9%) or glucose 50 mg/mL (5%) to prepare a diluted solution with a final concentration ranging from 1 to 10 mg/mL. Each vial contains an excess fill of 0.25 ml (total content per vial 4.25 ml) to ensure the recovery of 4 ml of concentrate. Mix diluted solution by gentle inversion.
- From a microbiological point of view, the product, once diluted, should be used immediately. The diluted solution must not be frozen. If not used immediately, chemical and physical in-use stability of KEYTRUDA has been demonstrated for 24 hours at 2°C to 8°C. This 24 hour hold may include up to 6 hours at room temperature (at or below 25°C). If refrigerated, the vials and/or intravenous bags must be allowed to come to room temperature prior to use. Administer

the infusion solution intravenously over 30 minutes using a sterile, non-pyrogenic, low-protein binding 0.2 to 5 µm in-line or add-on filter.

- Do not co-administer other medicinal products through the same infusion line.
- KEYTRUDA is for single use only. Discard any unused portion left in the vial.

Any unused medicinal product or waste material should be disposed of in accordance with local requirements.