

## SUMMARY OF PRODUCT CHARACTERISTICS

### 1 NAME OF THE MEDICINAL PRODUCT

Binosto Once Weekly 70 mg effervescent tablets

### 2 QUALITATIVE AND QUANTITATIVE COMPOSITION

Each effervescent tablet contains 70 mg alendronic acid as 91.37 mg of alendronate sodium trihydrate.

Excipients: each effervescent tablet contains 602.54 mg of sodium.

For a full list of excipients, see section 6.1.

### 3 PHARMACEUTICAL FORM

Effervescent Tablet

White to off-white round effervescent tablets of 25 mm diameter, flat faced with bevelled edges. After dissolution the solution has a pH of 4.8 – 5.4

### 4 CLINICAL PARTICULARS

#### 4.1 Therapeutic indications

Treatment of postmenopausal osteoporosis. Binosto 70 mg reduces the risk of vertebral and hip fractures.

#### 4.2 Posology and method of administration

##### Posology

The recommended dose is one 70 mg effervescent tablet once weekly.

Patients should be instructed that if they miss a dose of Binosto 70 mg, they should take one effervescent tablet on the morning after they remember.

They should not take two effervescent tablets on the same day but should return to taking one effervescent tablet once a week, as originally scheduled on their chosen day.

The optimal duration of bisphosphonate treatment for osteoporosis has not been established.

The need for continued treatment should be re-evaluated periodically based on the benefits and potential risks of Binosto on an individual patient basis, particularly after 5 or more years of use.

##### *Use in the elderly:*

In clinical studies there was no age related difference in the efficacy or safety profiles of alendronate. Therefore no dosage adjustment is necessary for the elderly.

##### *Use in renal impairment:*

No dosage adjustment is necessary for patients with GFR greater than 35 ml/min.

Alendronate is not recommended for patients with renal impairment where GFR is less than 35 ml/min, due to lack of experience.

### *Paediatric population*

Alendronate sodium is not recommended for use in children under the age of 18 years due to insufficient data on safety and efficacy in conditions associated with paediatric osteoporosis (also see section 5.1).

### Method of administration

#### *To permit adequate absorption of alendronate:*

Binosto 70 mg must be taken at least 30 minutes before the first food, beverage, or medicinal product of the day with plain water only. Other beverages (including mineral water), food and some medicinal products are likely to reduce the absorption of alendronate (see section 4.5).

#### *To facilitate delivery to the stomach and thus reduce the potential for local and oesophageal irritation/adverse experiences (see section 4.4):*

- Binosto 70 mg should only be taken upon arising for the day dissolved in half a glass of plain water (not less than 120 ml or 4.2 fl.oz.). Dissolving the tablet in water yields a buffered solution of pH 4.8 – 5.4. The buffered solution should be drunk, once the fizzing has subsided and the effervescent tablet has completely dissolved to give a clear, colourless buffered solution, followed by at least 30 ml (one sixth of a glass) of plain water. Additional plain water may be taken.
- **Patients should not swallow the undissolved effervescent tablet, should not chew the effervescent tablet or allow the effervescent tablet to dissolve in their mouths because of the risk for oropharyngeal irritation (see sections 4.4 and 4.8).**
- If the tablet does not dissolve completely, the buffered solution may be stirred until it is clear and colourless.
- Patients should not lie down until after their first food of the day, which should be at least 30 minutes after drinking the oral solution.
- Patients should not lie down for at least 30 minutes after drinking the oral solution.
- Binosto 70 mg should not be taken at bedtime or before arising for the day.
- Binosto 70 mg can be given to patients who are unable or unwilling to swallow tablets.

Patients should receive supplemental calcium and vitamin D if dietary intake is inadequate (see section 4.4).

Binosto 70 mg has not been investigated in the treatment of glucocorticoid-induced osteoporosis.

### **4.3 Contraindications**

- Hypersensitivity to alendronate or to any of the excipients listed in section 6.1.
- Abnormalities of the oesophagus and other factors which delay oesophageal emptying such as stricture or achalasia.
- Inability to stand or sit upright for at least 30 minutes.
- Hypocalcaemia.
- See also section 4.4.

### **4.4 Special warnings and precautions for use**

Alendronate can cause local irritation of the upper gastro-intestinal mucosa. Because there is a potential for worsening of the underlying disease, caution should be used when alendronate is given to patients with active upper gastro-intestinal problems, such as dysphagia, oesophageal disease, gastritis, duodenitis, ulcers, or with a recent history (1 year) of major gastro-intestinal disease such as peptic ulcer, or active gastro-intestinal bleeding, or surgery of the upper gastro-intestinal tract other than pyloroplasty (see section 4.3). In patients with known Barrett's oesophagus, prescribers should consider the benefits and potential risks of alendronate on an individual patient basis.

Oesophageal reactions (sometimes severe and requiring hospitalisation), such as oesophagitis, oesophageal erosions and oesophageal ulcers, rarely followed by oesophageal stricture, have been reported in patients receiving alendronate. Physicians should therefore be alert to any signs or symptoms signalling a possible oesophageal reaction and patients should be instructed to discontinue

alendronate and seek medical attention if they develop symptoms of oesophageal irritation such as dysphagia, pain on swallowing or retrosternal pain, new or worsening heartburn.

The risk of severe oesophageal adverse experiences appears to be greater in patients who fail to take alendronate properly and/or who continue to take alendronate after developing symptoms suggestive of oesophageal irritation. It is very important that the full dosing instructions are provided to, and understood by the patient (see section 4.2). Patients should be informed that failure to follow these instructions may increase their risk of oesophageal problems.

While no increased risk was observed in extensive clinical trials conducted with alendronate tablets, there have been rare (post-marketing) reports of gastric and duodenal ulcers, some severe and with complications.

Osteonecrosis of the jaw, generally associated with tooth extraction and/or local infection (including osteomyelitis), has been reported in patients with cancer receiving treatment regimens including primarily intravenously administered bisphosphonates. Many of these patients were also receiving chemotherapy and corticosteroids. Osteonecrosis of the jaw has also been reported in patients with osteoporosis receiving oral bisphosphonates.

The following risk factors should be considered when evaluating an individual's risk of developing osteonecrosis of the jaw:

- potency of the bisphosphonate (highest for zoledronic acid), route of administration (see above) and cumulative dose
- cancer, chemotherapy, radiotherapy, corticosteroids, smoking
- a history of dental disease, poor oral hygiene, periodontal disease, invasive dental procedures and poorly fitting dentures.

A dental examination with appropriate preventive dentistry should be considered prior to treatment with bisphosphonates in patients with poor dental status.

While on treatment, these patients should avoid invasive dental procedures if possible. For patients who develop osteonecrosis of the jaw while on bisphosphonate therapy, dental surgery may exacerbate the condition. For patients requiring dental procedures, there are no data available to suggest whether discontinuation of bisphosphonate treatment reduces the risk of osteonecrosis of the jaw.

Clinical judgement of the treating physician should guide the management plan of each patient based on individual benefit/risk assessment.

During bisphosphonate treatment, all patients should be encouraged to maintain good oral hygiene, receive routine dental check-ups, and report any oral symptoms such as dental mobility, pain or swelling.

Bone, joint, and/or muscle pain has been reported in patients taking bisphosphonates. In post-marketing experience, these symptoms have rarely been severe and/or incapacitating (see section 4.8). The time to onset of symptoms varied from one day to several months after starting treatment. Most patients had relief of symptoms after stopping. A subset had recurrence of symptoms when rechallenged with the same drug or another bisphosphonate.

#### Atypical fractures of the femur

Atypical subtrochanteric and diaphyseal femoral fractures have been reported with bisphosphonate therapy, primarily in patients receiving long-term treatment for osteoporosis. These transverse or short oblique fractures can occur anywhere along the femur from just below the lesser trochanter to just above the supracondylar flare. These fractures occur after minimal or no trauma and some patients experience thigh or groin pain, often associated with imaging features of stress fractures, weeks to months before presenting with a completed femoral fracture. Fractures are often bilateral; therefore the contralateral femur should be examined in bisphosphonate-treated patients who have sustained a femoral shaft fracture. Poor healing of these fractures has also been reported. Discontinuation of bisphosphonate therapy in patients suspected to have an atypical femur fracture

should be considered pending evaluation of the patient, based on an individual benefit risk assessment.

During bisphosphonate treatment patients should be advised to report any thigh, hip or groin pain and any patient presenting with such symptoms should be evaluated for an incomplete femur fracture.

In post-marketing experience of alendronate, there have been rare reports of severe skin reactions including Steven Johnson syndrome and toxic epidermal necrolysis.

Osteonecrosis of the external auditory canal has been reported with bisphosphonates, mainly in association with long-term therapy. Possible risk factors for osteonecrosis of the external auditory canal include steroid use and chemotherapy and/or local risk factors such as infection or trauma. The possibility of osteonecrosis of the external auditory canal should be considered in patients receiving bisphosphonates who present with ear symptoms including chronic ear infections.

Alendronate is not recommended for patients with renal impairment where GFR is less than 35 ml/min, (see section 4.2).

#### *Paediatric population*

Alendronate sodium is not recommended for use in children under the age of 18 years due to insufficient data on safety and efficacy in conditions associated with paediatric osteoporosis (also see sections 4.2 and 5.1)

Causes of osteoporosis other than oestrogen deficiency and ageing or glucocorticoid use should be considered.

Hypocalcaemia must be corrected before initiating therapy with alendronate (see section 4.3).

Other disorders affecting mineral metabolism (such as vitamin D deficiency and hypoparathyroidism) should also be effectively treated before starting Binosto treatment. In patients with these conditions, serum calcium and symptoms of hypocalcaemia should be monitored during therapy with Binosto 70 mg.

Due to the positive effects of alendronate in increasing bone mineral, decreases in serum calcium and phosphate may occur especially in patients taking glucocorticoids in whom calcium absorption may be decreased. These are usually small and asymptomatic. However, there have been rare reports of symptomatic hypocalcaemia, which have occasionally been severe and often occurred in patients with predisposing conditions (e.g. hypoparathyroidism, vitamin D deficiency and calcium malabsorption).

Ensuring adequate calcium and vitamin D intake is particularly important in patients receiving glucocorticoids.

#### *Excipients*

This medicinal product contains 26.2 mmol (or 602.54 mg) sodium per dose. To be taken into consideration by patients on a controlled sodium diet.

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

If taken at the same time, it is likely that food and beverages (including mineral water), calcium supplements, antacids, and some oral medicinal products will interfere with absorption of alendronate. Therefore, patients must wait at least 30 minutes after taking alendronate before taking any other oral medicinal product (see section 4.2 and 5.2).

In healthy subjects, oral prednisone (20 mg three times daily for five days) did not produce a clinically meaningful change in oral bioavailability of alendronate (a mean increase ranging from 20% to 44%).

No other interactions with medicinal products of clinical significance are anticipated. A number of patients in the clinical trials received oestrogen (intravaginal, transdermal, or oral) while taking alendronate. No adverse experiences attributable to their concomitant use were identified.

Since NSAID use is associated with gastrointestinal irritation, caution should be used during concomitant use with alendronate.

Although otherwise specific interaction studies were not performed, in clinical studies alendronate was used concomitantly with a wide range of commonly prescribed medicinal products without evidence of clinical adverse interactions.

#### 4.6 Fertility, pregnancy and lactation

##### *Pregnancy*

Alendronate should not be used during pregnancy. There are no adequate data from the use of alendronate in pregnant women. Animal studies do not indicate direct harmful effects with respect to pregnancy, embryonal/foetal development, or postnatal development. Alendronate given during pregnancy in rats caused dystocia related to hypocalcemia (see section 5.3).

##### *Breastfeeding*

It is unknown whether alendronate is excreted into human breast milk. Given the indication, alendronate should not be used by breast-feeding women.

##### *Fertility*

Bisphosphonates are incorporated into the bone matrix, from which they are gradually released over a period of years. The amount of bisphosphonate incorporated into adult bone, and hence, the amount available for release back into the systemic circulation, is directly related to the dose and duration of bisphosphonate use (see section 5.2). There are no data on fetal risk in humans. However, there is a theoretical risk of fetal harm, predominantly skeletal, if a woman becomes pregnant after completing a course of bisphosphonate therapy. The impact of variables such as time between cessation of bisphosphonate therapy to conception, the particular bisphosphonate used, and the route of administration (intravenous versus oral) on the risk has not been studied.

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

No studies on the effects on the ability to drive and use machines have been performed. However, certain adverse reactions that have been reported with alendronate may affect some patients' ability to drive or operate machinery. Individual responses to alendronate may vary (see section 4.8).

#### 4.8 Undesirable effects

In a one-year study in post-menopausal women with osteoporosis the overall safety profiles of alendronate 70 mg once weekly (n=519) and alendronate 10 mg/day (n=370) were similar.

In two three-year studies of virtually identical design, in post-menopausal women (alendronate 10 mg: n=196, placebo: n=397) the overall safety profiles of alendronate 10 mg/day and placebo were similar.

Adverse reactions reported by the investigators as possibly, probably or definitely drug-related are presented below if they occurred in  $\geq 1\%$  in either treatment group in the one-year study, or in  $\geq 1\%$  of patients treated with alendronate 10 mg/day and at a greater incidence than in patients given placebo in the three-year studies:

	ONE-YEAR STUDY		THREE-YEAR STUDIES	
	alendronate Once Weekly 70 mg (n=519) %	alendronate 10 mg/day (n=370) %	alendronate 10mg/day (n=196) %	placebo (n=397) %
<u>Gastro-intestinal</u>				

abdominal pain	3.7	3.0	6.6	4.8
dyspepsia	2.7	2.2	3.6	3.5
acid regurgitation	1.9	2.4	2.0	4.3
nausea	1.9	2.4	3.6	4.0
abdominal distension	1.0	1.4	1.0	0.8
constipation	0.8	1.6	3.1	1.8
diarrhoea	0.6	0.5	3.1	1.8
dysphagia	0.4	0.5	1.0	0.0
flatulence	0.4	1.6	2.6	0.5
gastritis	0.2	1.1	0.5	1.3
gastric ulcer	0.0	1.1	0.0	0.0
oesophageal ulcer	0.0	0.0	1.5	0.0
<u>Musculoskeletal</u>				
musculoskeletal pain (bone, muscle or joint)	2.9	3.2	4.1	2.5
muscle cramp	0.2	1.1	0.0	1.0
<u>Neurological</u>				
headache	0.4	0.3	2.6	1.5

The following adverse reactions have been reported during clinical studies and/or post-marketing use of oral alendronate tablets:

	Adverse reactions				
	Very Common (≥1/10)	Common (≥ 1/100, < 1/10)	Uncommon (≥1/1,000, <1/100)	Rare (≥1/10,000, <1/1,000)	Very Rare (<1/10,000)
Immune system disorders				hypersensitivity reactions including urticaria and angioedema	
Metabolism and nutrition disorders				symptomatic hypocalcaemia, often in association with predisposing conditions <sup>#</sup> .	
Nervous system disorders		headache, dizziness <sup>§</sup>	dysgeusia <sup>§</sup>		
Eye disorders			eye inflammation (uveitis, scleritis, episcleritis)		
Ear and labyrinth disorders		vertigo <sup>§</sup>			
‡Gastrointestinal disorders		abdominal pain, dyspepsia, constipation, diarrhoea, flatulence, oesophageal	nausea, vomiting, gastritis, oesophagitis*, oesophageal erosions*, melena <sup>§</sup>	oesophageal stricture*, oropharyngeal ulceration*, upper gastrointestinal PUBs	

		ulcer*, dysphagia*, abdominal distension, acid regurgitation		(perforation, ulcers, bleeding)#	
Skin and subcutaneous tissue disorders		alopecia <sup>§</sup> , pruritus <sup>§</sup>	rash, erythema	rash with photosensitiv ity, severe skin reactions including Stevens- Johnson syndrome and toxic epidermal necrolysis <sup>+</sup>	
Musculoskeletal, connective tissue and bone disorders:	musculoskelet al (bone, muscle or joint) pain, which is sometimes severe <sup>#§</sup>	joint swelling <sup>§</sup>		Atypical subtrochanteri c and diaphyseal femoral fractures (bisphosphona te class adverse reaction) # Osteonecrosis of the jaw <sup>§+</sup> , stress fractures of the proximal femoral shaft <sup>§+</sup>	Osteonecrosis of the external auditory canal (bisphosphona te class adverse reaction)
General disorders and administration site condition		asthenia <sup>§</sup> , peripheral oedema <sup>§</sup>	transient symptoms as in an acute- phase response (myalgia, malaise and rarely, fever) typically in association with initiation of treatment <sup>§</sup> .		

#See section 4.4

§Frequency in Clinical Trials was similar in the drug and placebo group.

\*See sections 4.2 and 4.4

+This adverse reaction was identified through post-marketing surveillance. The frequency of rare was estimated based on relevant clinical trials

‡These adverse reactions were identified with the tablet form, and may not all apply to Binosto 70 mg, which is taken as a buffered oral solution.

#### 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 HPRC Pharmacovigilance,

Earlsfort Terrace, IRL - Dublin 2; Tel: +353 1 6764971; Fax: +353 1 6762517. Website: [www.hpra.ie](http://www.hpra.ie);  
E-mail: [medsafety@hpra.ie](mailto:medsafety@hpra.ie).

#### 4.9 Overdose

Hypocalcaemia, hypophosphataemia and upper gastro-intestinal adverse events, such as upset stomach, heartburn, oesophagitis, gastritis, or ulcer, may result from oral overdosage.

No specific information is available on the treatment of overdosage with alendronate. Milk or antacids should be given to bind alendronate. Owing to the risk of oesophageal irritation, vomiting should not be induced and the patient should remain fully upright

## 5 PHARMACOLOGICAL PROPERTIES

### 5.1 Pharmacodynamic properties

#### ***Pharmacotherapeutic group:***

Drugs affecting bone structure and mineralisation, bisphosphonates  
ATC Code: M05B A04

The active ingredient of Binosto 70 mg, alendronate sodium trihydrate, is a bisphosphonate that inhibits osteoclastic bone resorption with no direct effect on bone formation.

Preclinical studies have shown preferential localisation of alendronate to sites of active resorption. Activity of osteoclasts is inhibited, but recruitment or attachment of osteoclasts is not affected. The bone formed during treatment with alendronate is of normal quality.

Oesophageal toxicity associated with alendronate treatment is a multifactorial effect that seems predominately mediated by local irritations of the oesophageal mucosa through crystalline matter, which is also known as pill oesophagitis. Gastroesophageal acid reflux might be a concomitant factor, as acid blockage is one of the main treatments once alendronate-associated oesophagitis occurs. Binosto 70 mg effervescent tablet administered as a buffered solution was designed to fully solubilise alendronate in a drinkable solution of high pH with acid neutralising capacity, to minimise particulate alendronate from contacting the mucosa and to prevent strong stomach acid being present in the stomach, diminishing damage potential in cases of oesophageal reflux. Refer to section 4.8 for post marketing data retrieved from the US.

#### *Treatment of post-menopausal osteoporosis*

**Osteoporosis is defined as BMD of the spine or hip 2.5 SD below the mean value of a normal young population or as a previous fragility fracture, irrespective of BMD.**

The therapeutic equivalence of alendronate 70 mg once weekly (n=519) and alendronate 10 mg daily (n=370) was demonstrated in a one-year multicentre study of post-menopausal women with osteoporosis.

The mean increases from baseline in lumbar spine BMD at one year were 5.1% (95% CI: 4.8, 5.4%) in the 70 mg once-weekly group and 5.4% (95% CI: 5.0, 5.8%) in the 10 mg daily group. The mean BMD increases were 2.3% and 2.9% at the femoral neck and 2.9% and 3.1% at the total hip in the 70 mg once weekly and 10 mg daily groups, respectively. The two treatment groups were also similar with regard to BMD increases at other skeletal sites.

The effects of alendronate on bone mass and fracture incidence in post-menopausal women were examined in two initial efficacy studies of identical design (n=994) as well as in the Fracture Intervention Trial (FIT: n=6,459).

In the initial efficacy studies, the mean bone mineral density (BMD) increases with alendronate 10 mg/day relative to placebo at three years were 8.8%, 5.9% and 7.8% at the spine, femoral neck and trochanter, respectively. Total body BMD also increased significantly. There was a 48% reduction

(alendronate 3.2% vs placebo 6.2%) in the proportion of patients treated with alendronate experiencing one or more vertebral fractures relative to those treated with placebo. In the two-year extension of these studies BMD at the spine and trochanter continued to increase and BMD at the femoral neck and total body were maintained.

FIT consisted of two placebo-controlled studies using alendronate daily (5 mg daily for two years and 10 mg daily for either one or two additional years):

- FIT 1: A three-year study of 2,027 patients who had at least one baseline vertebral (compression) fracture. In this study alendronate daily reduced the incidence of  $\geq 1$  new vertebral fracture by 47% (alendronate 7.9% vs. placebo 15.0%). In addition, a statistically significant reduction was found in the incidence of hip fractures (1.1% vs. 2.2%, a reduction of 51%).
- FIT 2: A four-year study of 4,432 patients with low bone mass but without a baseline vertebral fracture. In this study, a significant difference was observed in the analysis of the subgroup of osteoporotic women (37% of the global population who correspond with the above definition of osteoporosis) in the incidence of  $\geq 1$  vertebral fracture (2.9% vs. 5.8%, a reduction of 50%) and in the incidence of hip fractures (alendronate 1.0% vs. placebo 2.2%, a reduction of 56%).

#### *Clinical efficacy of (Invented name) 70 mg, effervescent tablets for oral solution*

BC-118-07: A clinical study with Binosto 70 mg performed in 12 healthy female subjects. This clinical study evaluated gastric emptying and gastric pH after administration of a conventional tablet and Binosto 70 mg, effervescent tablet, with a high buffering capacity. The buffered solution has the potential for improving gastric tolerance. Both formulations tested, rapidly cleared the oesophagus and there were no statistically significant or physiologically relevant differences in gastric emptying times.

Mucosal exposure to alendronate at a pH less than 3 is irritating to gastro-oesophageal tissue. Ingestion of a conventional tablet resulted in alendronate being present in the stomach at a pH below 3 within minutes. After dosing with Binosto 70 mg, the gastric pH generally increased to approximately 5 and remained at a plateau for 30 minutes then gradually decreased. The time taken for the gastric pH to drop below 3, after the ingestion of the medications was significantly higher with the effervescent tablets, in comparison to the conventional tablet.

Therefore, Binosto 70 mg minimises the possibility of exposing the oesophagus (in case of reflux) and the stomach to acidified alendronate.

#### *Laboratory test findings*

In clinical studies, asymptomatic, mild and transient decreases in serum calcium and phosphate were observed in approximately 18 and 10%, respectively, of patients taking alendronate 10 mg/day versus approximately 12 and 3% of those taking placebo.

However, the incidences of decreases in serum calcium to  $< 8.0$  mg/dl (2.0 mmol/l) and serum phosphate to  $\leq 2.0$  mg/dl (0.65 mmol/l) were similar in both treatment groups.

#### *Paediatric population*

Alendronate sodium has been studied in a small number of patients with osteogenesis imperfecta under the age of 18 years. Results are insufficient to support the use of alendronate sodium in paediatric patients with osteogenesis imperfecta.

## **5.2 Pharmacokinetic properties**

### *Absorption*

Relative to an intravenous reference dose, the oral mean bioavailability of alendronate tablets in women was 0.64% for doses ranging from 5 to 70 mg when administered after an overnight fast and two hours before a standardised breakfast. Bioavailability was decreased similarly to an estimated 0.46% and 0.39% when alendronate was administered one hour or half an hour before a standardised breakfast.

The bioavailability of Binosto 70 mg effervescent tablets is equivalent to that of alendronate tablets, but the intra-individual variation in excretion (and therefore in absorption) is smaller for the effervescent tablets (CV 32.0 vs 42.1% cumulative excretion in the first 48 hours, CV 37.5 vs 45.6% maximum excretion rate).

In osteoporosis studies, alendronate was effective when administered at least 30 minutes before the first food or beverage of the day.

Bioavailability was negligible whether alendronate was administered with, or up to two hours after, a standardised breakfast. Concomitant administration of alendronate with coffee or orange juice reduced bioavailability by approximately 60%.

#### *Distribution*

Studies in rats show that alendronate transiently distributes to soft tissues following 1 mg/kg intravenous administration but is then rapidly redistributed to bone or excreted in the urine. The mean steady-state volume of distribution, exclusive of bone, is at least 28 litres in humans. Concentrations of drug in plasma following therapeutic oral doses are too low for analytical detection (< 5 ng/ml). Protein binding in human plasma is approximately 78%.

#### *Biotransformation*

There is no evidence that alendronate is metabolised in animals or humans.

#### *Elimination*

Following a single intravenous dose of [<sup>14</sup>C] alendronate, approximately 50% of the radioactivity was excreted in the urine within 72 hours and little or no radioactivity was recovered in the faeces.

Following a single 10 mg intravenous dose, the renal clearance of alendronate was 71 ml/min, and systemic clearance did not exceed 200 ml/min.

Plasma concentrations fell by more than 95% within six hours following intravenous administration. The terminal half-life in humans is estimated to exceed ten years, reflecting release of alendronate from the skeleton. Alendronate is not excreted through the acidic or basic transport systems of the kidney in rats, and thus it is not anticipated to interfere with the excretion of other medicinal products by those systems in humans.

#### *Characteristics in patients*

Preclinical studies show that the drug that is not deposited in bone is rapidly excreted in the urine. No evidence of saturation of bone uptake was found after chronic dosing with cumulative intravenous doses up to 35 mg/kg in animals. Although no clinical information is available, it is likely that, as in animals, elimination of alendronate via the kidney will be reduced in patients with impaired renal function. Therefore, somewhat greater accumulation of alendronate in bone might be expected in patients with impaired renal function (see section 4.2).

### **5.3 Preclinical safety data**

Non-clinical data reveal no special hazard for humans based on conventional studies of safety pharmacology, repeated dose toxicity, genotoxicity and carcinogenic potential.

Studies in rats have shown that treatment with alendronate during pregnancy was associated with dystocia in dams during parturition, which was related to hypocalcaemia.

In studies, rats given high doses showed an increased incidence of incomplete foetal ossification. The relevance to humans is unknown.

## **6 PHARMACEUTICAL PARTICULARS**

### **6.1 List of excipients**

Sodium dihydrogen citrate  
Citric acid anhydrous

Sodium hydrogen carbonate  
Sodium carbonate anhydrous  
Strawberry flavour [Maltodextrin (Maize), Arabic gum, Propylene glycol (E1520), nature-identical flavouring substances]  
Acesulfame potassium  
Sucralose

## **6.2 Incompatibilities**

Not applicable.

## **6.3 Shelf life**

4 years.

## **6.4 Special precautions for storage**

This medicinal product does not require any special temperature storage conditions. Store in the original package in order to protect from moisture.

## **6.5 Nature and contents of container**

The effervescent tablets are provided in strips of composite foil (paper / polyethylene / aluminium / Zn-ionomer), with 2 effervescent tablets packed in individual units per strip.

Packs with 4, 12 or 24 effervescent tablets.

Not all pack sizes may be marketed.

## **6.6 Special precautions for disposal and other handling**

No special requirements for disposal.

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

The appearance of the product after dissolution is a clear colourless solution.

## **7 MARKETING AUTHORISATION HOLDER**

Clonmel Healthcare Ltd  
Waterford Road  
Clonmel  
Co. Tipperary

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

PA0126/280/001

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

Date of First Authorisation: 2<sup>nd</sup> March 2012

## **10 DATE OF REVISION OF THE TEXT**

August 2016