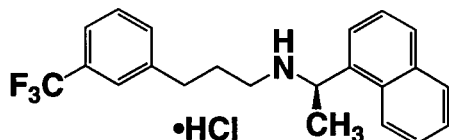


## Sensipar<sup>®</sup> (cinacalcet hydrochloride)

### NAME OF THE MEDICINE

Cinacalcet is presented in tablets as the hydrochloride salt. Cinacalcet hydrochloride is described chemically as N-[1-(R)-(1-naphthyl)ethyl]-3-[3-(trifluoromethyl)phenyl]-1-aminopropane hydrochloride and has the following structural formula:



### DESCRIPTION

Cinacalcet is a calcimimetic agent that increases the sensitivity of the calcium sensing receptor to extracellular calcium. The empirical formula of cinacalcet hydrochloride is  $C_{22}H_{22}F_3N \cdot HCl$  and it has a molecular weight of 393.9 g/mol (hydrochloride salt) and 357.4 g/mol (free base). It has one chiral centre having an R-absolute configuration. The R-enantiomer is the more potent enantiomer and has been shown to be responsible for pharmacodynamic activity.

Cinacalcet hydrochloride is a white to off-white, crystalline solid that is soluble in methanol or 95% ethanol and poorly soluble in water.

Sensipar<sup>®</sup> is a solid oral dosage form formulated as light green, film-coated, oval-shaped tablets for oral administration in strengths of 30 mg, 60 mg and 90 mg of cinacalcet as the free base equivalent (corresponding to 33 mg, 66 mg and 99 mg as the hydrochloride salt, respectively).

Sensipar<sup>®</sup> tablets are comprised of the active ingredient, and the following inactive ingredients: pre-gelatinised starch, microcrystalline cellulose, povidone, crospovidone, colloidal silicon dioxide, magnesium stearate, and water. Tablets are coated with colour (Opadry<sup>®</sup> II green), a clear film-coat (Opadry<sup>®</sup> clear) and carnauba wax.

### PHARMACOLOGY

#### Mechanism of Action

Cinacalcet reduces PTH while simultaneously lowering Ca x P, calcium and phosphorus levels in chronic kidney disease in patients receiving dialysis.

Secondary hyperparathyroidism (HPT) is a progressive disease, which occurs in patients with chronic kidney disease (CKD) and manifests as increases in parathyroid hormone (PTH) levels and derangements in calcium and phosphorus metabolism. Increased PTH stimulates osteoclastic activity resulting in cortical bone resorption and marrow fibrosis. The calcium sensing receptor on the surface of the chief cell of the parathyroid gland is the principal regulator of PTH secretion. Cinacalcet directly lowers PTH levels by increasing the sensitivity of the calcium sensing receptor to extracellular calcium. The reduction in PTH is associated with a concomitant decrease in serum calcium levels.

In CKD patients with uncontrolled secondary HPT, reductions in PTH were associated with a favourable impact on bone specific alkaline phosphatase (BALP), N-telopeptide (N-Tx), bone turnover, bone fibrosis, and incidence of bone fracture.

Studies in a rat model of chronic renal insufficiency (CRI) (5/6 nephrectomy) assessed the effects of cinacalcet treatment on parathyroid gland hyperplasia. Cinacalcet treatment reduced PTH and parathyroid cell proliferation to levels comparable to vehicle-treated, non-nephrectomised animals, demonstrating that cinacalcet prevented the development of secondary HPT.

### **Pharmacodynamics**

Reductions in PTH levels correlate with cinacalcet concentrations. Nadir PTH occurs approximately 2 to 6 hours post dose, corresponding with cinacalcet  $C_{max}$ . After steady state is reached, serum calcium concentrations remain constant over the dosing interval.

### **Pharmacokinetics**

#### ***Absorption and Distribution***

After oral administration of cinacalcet, maximum plasma concentration is achieved in approximately 2 to 6 hours. The absolute bioavailability of cinacalcet is approximately 25%. Administration of cinacalcet with food results in an approximate 50 to 80% increase in bioavailability. Increases in plasma concentrations are similar, regardless of the fat content of the meal.

After absorption, cinacalcet concentrations decline in a biphasic fashion with an initial half-life of approximately 6 hours and a terminal half-life of 30 to 40 hours. Steady state drug levels are achieved within 7 days with minimal accumulation. The AUC and  $C_{max}$  of cinacalcet increase linearly over the once daily dose range of 30 to 180 mg. The pharmacokinetics of cinacalcet do not change over time. The volume of distribution is high (approximately 1000 L), indicating extensive distribution. Cinacalcet in plasma is approximately 97% bound to plasma proteins and in whole blood, cinacalcet distributes minimally into red blood cells.

#### ***Metabolism and Excretion***

Cinacalcet is metabolised by multiple enzymes, primarily CYP3A4, CYP1A2 and CYP2D6. The major circulating metabolites are inactive. After administration of a 75 mg radiolabeled dose to healthy volunteers, cinacalcet was rapidly and extensively metabolised by oxidation followed by conjugation. Renal excretion of metabolites was the prevalent route of elimination of radioactivity. Approximately 80% of the dose was recovered in the urine and 15% in the faeces.

### **Special Populations**

#### ***Hepatic Insufficiency***

Mild hepatic impairment did not alter the pharmacokinetics of cinacalcet. Compared to subjects with normal liver function, average AUC of cinacalcet was approximately 2 times higher in subjects with moderate impairment and approximately 4 times higher in subjects with severe impairment (see PRECAUTIONS). Because doses are titrated for each subject based on safety and efficacy parameters, no additional dose adjustment is necessary for subjects with hepatic impairment.

#### ***Renal Insufficiency***

The pharmacokinetic profile of cinacalcet in patients with mild, moderate, and severe renal insufficiency, and those on haemodialysis or peritoneal dialysis is comparable to that in healthy volunteers. No dosage adjustment based on the degree of renal function is necessary.

#### ***Geriatric Patients***

There are no clinically relevant differences due to age in the pharmacokinetics of cinacalcet. No dosage adjustment based on age is necessary.

### Paediatric Patients

The safety and efficacy of cinacalcet has not been studied in children and are not established. A single dose pharmacokinetic study has been completed in paediatric patients 6-17 years of age (N = 12). The pharmacokinetic parameters following a 15 mg dose are summarized in Table 1:

**Table 1. Paediatric Single Dose PK results**

Parameter	15 mg in Paediatric Subjects				30 mg in Adult * N = 13
	6-8 years N=3	9-11 years N=3	12-14 years N=3	15-17 years N=3	
AUC <sub>0-t</sub> hr*ng/mL	29.5 (15.6)	35.9 (35.8)	11.3 (4.4)	17.5 (5.9)	40.4 (15.9)
C <sub>max</sub> ng/mL	11.0 (3.22)	9.19 (7.28)	3.87 (1.82)	5.01 (2.15)	5.97 (3.06)

\* Data are from a separate study in healthy adults  
Data represent mean (standard deviation)

Whilst a 15 mg dose of cinacalcet was used in the paediatric PK study, this dose strength is not registered.

Six of the twelve subjects experienced decreases in serum calcium below the lower limit of normal (2.23 mmol/L). In these six subjects, baseline values were in the range of 2.20 to 2.52 mmol/L and the decreased values were in the range of 2.00 to 2.22 mmol/L. In the same study, QT interval prolongation, assessed as unrelated to cinacalcet, was reported in one of the twelve subjects.

The use of multiple doses in paediatric subjects has not been studied. On the basis of these limited data, there is a potential for higher exposures and greater pharmacodynamic effects in the lighter/younger relative to the heavier/old paediatric subjects when treated with identical doses of cinacalcet. (see PRECAUTIONS section: SERUM CALCIUM).

## CLINICAL TRIALS

### Secondary Hyperparathyroidism in Patients with Chronic Kidney Disease

Three, 6-month, multicentre, randomised, double-blind, placebo-controlled clinical studies were conducted in CKD patients receiving dialysis with uncontrolled secondary HPT (n = 665 on cinacalcet, 471 on placebo). The patient population consisted of both recently established and long-standing dialysis patients, with a range of 1 to 359 months. Cinacalcet was administered either alone or in combination with vitamin D sterols; 34% of patients were not receiving vitamin D sterols at study entry. The majority (more than 90%) of patients were receiving phosphate binders. Dose adjustments in phosphate binder therapy were permitted throughout the study. Vitamin D doses remained constant unless the patient developed hypercalcaemia, hypocalcaemia, or hyperphosphataemia. Patients continued on their previously prescribed drugs including: calcium channel blockers, ACE inhibitors, beta-blockers, hypoglycaemics, and lipid lowering agents. Cinacalcet (or placebo) was initiated at a dose of 30 mg and titrated every 3 or 4 weeks to a maximum dose of 180 mg once daily to achieve an iPTH of 10.6 to 26.5 pmol/L (1.5 to 4 times the upper limit of normal). The severity of secondary HPT ranged from mild to severe (iPTH values of 28.8 to 969.5 pmol/L), with mean (SE) baseline iPTH concentrations across the 3 studies of 77.8 (2.2) and 72.5 (2.0) pmol/L for the cinacalcet and placebo groups, respectively. Significant reductions in iPTH, serum calcium-phosphorus product (Ca x P), calcium, and phosphorus were observed in the cinacalcet-treated patients compared with placebo-treated patients receiving standard of care, and the results were consistent across the 3 studies (Table 2).

**Table 2. Effects of Cinacalcet on iPTH, Ca x P, Serum Calcium, and Serum Phosphorus in 6-month Phase 3 Studies (Patients Receiving Dialysis)**

	Study 1		Study 2		Study 3	
	Placebo (N = 205)	Cinacalcet (N = 205)	Placebo (N = 165)	Cinacalcet (N = 166)	Placebo (N = 101)	Cinacalcet (N = 294)
<b>iPTH</b>						
Baseline (pmol/L)	69.1 (2.9)	67.5 (2.5)	66.8 (2.6)	69.2 (3.1)	88.3 (5.1)	90.0 (4.3)
Evaluation Phase (pmol/L)	74.0 (3.5)	40.8 (2.6)	72.9 (3.4)	38.3 (3.1)	90.4 (5.8)	55.8 (3.2)
Percent Change	9.5 (2.8)	-38.4 (2.9)	8.7 (2.8)	-47.5 (2.8)	4.1 (3.4)	-40.3 (2.1)
Patients Achieving Primary Endpoint (iPTH ≤ 26.5 pmol/L) (%)	4%	41%**	7%	46%**	6%	35%**
Patients Achieving ≥ 30% Reduction in iPTH (%)	11%	61%**	12%	68%**	10%	59%**
Patients Achieving iPTH ≤ 31.8 pmol/L (%)	9%	55%**	11%	56%**	9%	45%**
<b>Ca x P</b>						
Baseline (mmol <sup>2</sup> /L <sup>2</sup> )	4.93 (0.09)	5.00 (0.09)	4.92 (0.09)	4.92 (0.10)	4.91 (0.11)	4.80 (0.08)
Evaluation Phase (mmol <sup>2</sup> /L <sup>2</sup> )	4.82 (0.08)	4.21 (0.08)	4.79 (0.09)	4.02 (0.10)	4.68 (0.11)	4.03 (0.07)
Percent Change	1.5 (1.8)	-13.0 (1.7)**	-0.7 (1.9)	-16.7 (2.1)**	-1.4 (2.4)	-12.8 (1.7)**
<b>Calcium</b>						
Baseline (mmol/L)	2.48 (0.01)	2.46 (0.01)	2.48 (0.01)	2.51 (0.01)	2.50 (0.02)	2.45 (0.01)
Evaluation Phase (mmol/L)	2.48 (0.01)	2.30 (0.02)	2.48 (0.01)	2.31 (0.02)	2.52 (0.02)	2.28 (0.01)
Percent Change	0.5 (0.4)	-6.3 (0.6)**	0.3 (0.4)	-7.5 (0.6)**	0.9 (0.5)	-6.5 (0.6)**
<b>Phosphorus</b>						
Baseline (mmol/L)	2.00 (0.04)	2.04 (0.04)	2.00 (0.04)	1.96 (0.04)	1.97 (0.05)	1.97 (0.03)
Evaluation Phase (mmol/L)	1.95 (0.03)	1.84 (0.04)	1.94 (0.04)	1.74 (0.04)	1.87 (0.04)	1.77 (0.03)
Percent Change	1.1 (1.8)	-7.1 (1.7)**	-0.9 (1.9)	-9.9 (2.0)**	-2.2 (2.5)	-7.2 (1.6)*

\* p < 0.05; \*\* p < 0.001 compared to placebo  
Data represent mean (standard error) or percent

Mean iPTH and Ca x P by treatment group for the overall study population during the 6-month treatment period are presented in Figure 1 and Figure 2.

Figure 1. Mean (SE) Percent Change from Baseline in iPTH (Pooled Phase 3 Studies)

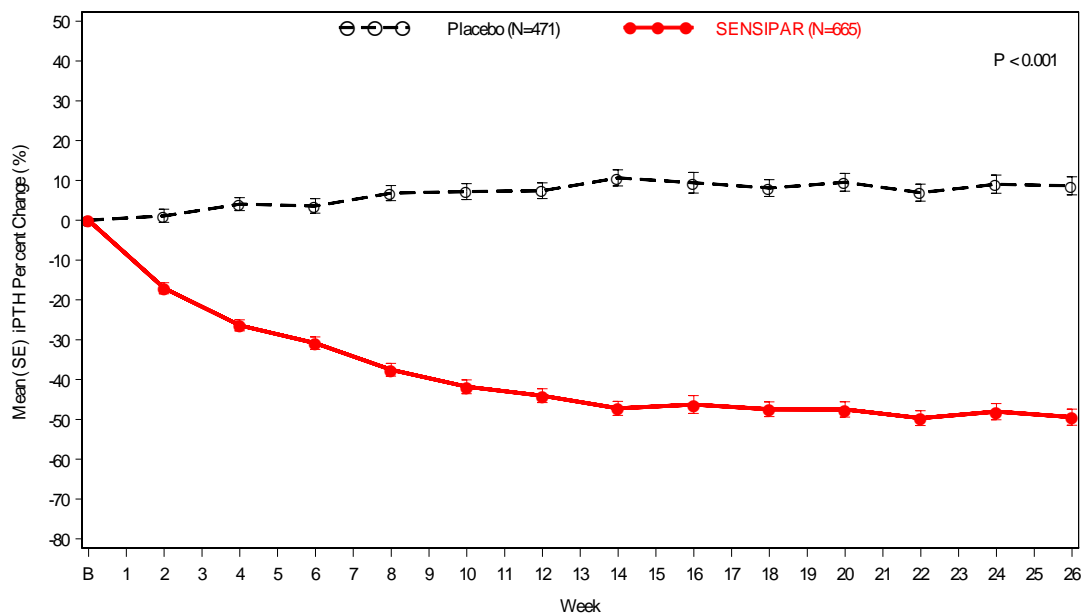
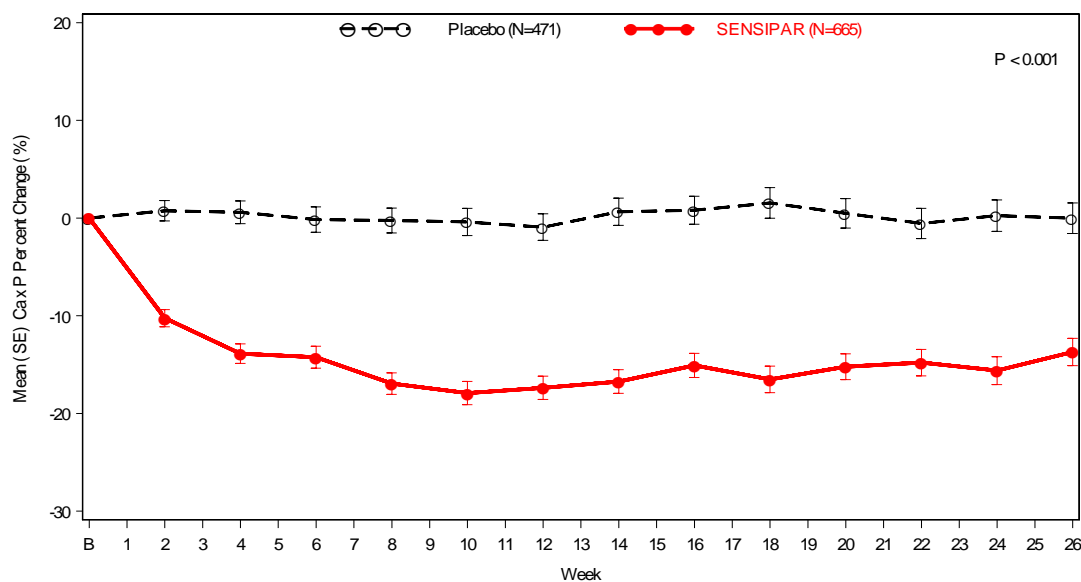


Figure 2. Mean (SE) Percent Change from Baseline in Ca x P (Pooled Phase 3 Studies)



In patients receiving cinacalcet, reductions in iPTH and Ca x P occurred within 2 weeks and were maintained for at least 12 months of treatment (n = 99 on cinacalcet, 111 on placebo).

Cinacalcet decreased iPTH and Ca x P levels regardless of disease severity (ie, baseline iPTH value), dialysis modality (PD versus HD), duration of dialysis, and whether or not vitamin D sterols were administered. Approximately 60% of patients with mild (iPTH from 31.8 to 53.0 pmol/L), moderate (iPTH between 53.0 and 84.8 pmol/L), or severe (iPTH above 84.8 pmol/L) secondary

HPT achieved at least a 30% reduction in iPTH levels. Cinacalcet treatment also reduced iPTH and Ca x P in patients with elevated Ca x P levels.

The impact of cinacalcet on bone disease, including the risk of adynamic bone disease, has not been conclusively evaluated.

The pivotal clinical studies were designed to evaluate the effect of cinacalcet on biochemical parameters, including PTH, serum calcium and phosphorus. Clinical outcomes such as quality of life, rate of parathyroidectomy, symptomatic bone disease, hospitalisation, or mortality were not pre-specified endpoints and were not evaluated within individual studies. The pivotal efficacy and safety studies in patients with secondary hyperparathyroidism of chronic kidney disease, requiring dialysis, did not examine quality of life benefits. There were no differences between cinacalcet and placebo treated patients in terms of statistically significant differences in self-reported cognitive functioning scale scores during the efficacy assessment phase.

### **Parathyroid Carcinoma**

Twenty-nine patients with parathyroid carcinoma were enrolled in an open-label study. Parathyroid carcinoma and severe hypercalcaemia in these patients was persistent despite previous parathyroidectomy and bisphosphonate therapy. The study consisted of two phases, a dose-titration phase and a maintenance phase. Cinacalcet was administered at doses ranging from 30 mg twice daily to 90 mg four times daily, and mean serum calcium declined from 3.53 to 3.10 mmol/L across the titration phase (up to 16 weeks). Sixty-two percent of patients (18 of 29) achieved a reduction in serum calcium of at least 0.25 mmol/L.

### **Primary HPT for Whom Parathyroidectomy is Not a Treatment Option**

Seventeen patients with primary HPT for whom parathyroidectomy was not a treatment option were enrolled in an open-label study. The study consisted of two phases, a dose-titration phase and a maintenance phase. Cinacalcet was administered at doses ranging from 30 mg twice daily to 90 mg four times daily, and mean serum calcium declined from 3.18 to 2.60 mmol/L across the titration phase (up to 16 weeks). Eighty-eight percent of patients (15 of 17) achieved a reduction in serum calcium of at least 0.25 mmol/L.

An additional 114 patients with primary HPT and hypercalcaemia, including 25 patients with recurrent primary HPT after parathyroidectomy, were enrolled in 4 controlled studies. In one study of 45 patients with primary HPT, including 12 patients with recurrent primary HPT after parathyroidectomy cinacalcet normalised serum calcium in approximately 80% of patients, and this was sustained for up to 3 years.

## **INDICATIONS**

Sensipar<sup>®</sup> may be used to treat the biochemical manifestations of secondary hyperparathyroidism in patients with end stage renal disease, receiving dialysis. Sensipar<sup>®</sup> should be used as adjunctive therapy.

Sensipar<sup>®</sup> is indicated for the treatment of hypercalcaemia in patients with parathyroid carcinoma.

Sensipar<sup>®</sup> may be used to treat the biochemical manifestations of primary hyperparathyroidism in patients for whom parathyroidectomy is not a treatment option.

## **CONTRAINDICATIONS**

Sensipar<sup>®</sup> is contraindicated in patients with hypersensitivity to any component(s) of this product.

## **PRECAUTIONS**

### **Seizures**

In three clinical studies of CKD patients on dialysis, seizures were observed in 1.4% (9/656) of cinacalcet treated patients and 0.4% (2/470) of placebo-treated patients. Five percent of the patients in both the cinacalcet and placebo groups reported a history of seizure disorder at baseline. While the basis for the reported difference in seizure rate is not clear, the threshold for seizures is lowered by significant reductions in serum calcium levels.

### **Hypotension and/or Worsening Heart Failure**

In post-marketing safety surveillance, isolated, idiosyncratic cases of hypotension and/or worsening heart failure have been reported in patients with impaired cardiac function, in which a

causal relationship to cinacalcet could not be completely excluded and may be mediated by reductions in serum calcium levels. Clinical trial data showed hypotension occurred in 7% of cinacalcet-treated patients, 12% of placebo-treated patients, and heart failure occurred in 2% of patients receiving cinacalcet or placebo.

### **Adynamic Bone**

In CKD patients receiving dialysis adynamic bone may develop if PTH levels are suppressed below 100 pg/mL (10.6 pmol/L). If PTH levels decrease below the recommended target range in patients treated with cinacalcet, the dose of vitamin D sterols and/or cinacalcet should be reduced or therapy discontinued.

### **Serum Calcium**

Cinacalcet treatment should not be initiated in patients with CKD receiving dialysis if serum calcium is less than 8.4 mg/dL [2.1 mmol/L]. Since cinacalcet lowers serum calcium, patients should be monitored for the occurrence of hypocalcaemia. In the event of hypocalcaemia, calcium-containing phosphate binders and/or vitamin D sterols can be used to raise serum calcium. If hypocalcaemia persists, reduce the dose or discontinue administration of cinacalcet (see DOSAGE AND ADMINISTRATION). Potential manifestations of hypocalcaemia may include paresthesias, myalgias, cramping, tetany, and seizures.

In CKD patients receiving dialysis who were administered cinacalcet, 4% of serum calcium values were less than 1.88 mmol/L (see ADVERSE EFFECTS : Laboratory Values). Less than 1% of patients receiving dialysis both in the group treated with cinacalcet and in the group treated with placebo permanently discontinued study drug due to hypocalcaemia.

Cinacalcet is not indicated for CKD patients not receiving dialysis. Investigational studies have shown that CKD patients not receiving dialysis treated with cinacalcet have an increased risk of hypocalcaemia (serum calcium levels less than 8.4 mg/dL [2.1 mmol/L]) compared with cinacalcet-treated CKD patients receiving dialysis, which may be due to lower baseline calcium levels and/or the presence of residual kidney function.

### **Hepatic Insufficiency**

Due to the potential for 2 to 4 times higher plasma levels of cinacalcet in patients with moderate to severe hepatic impairment, physicians should closely monitor these patients when initiating cinacalcet (see PHARMACOKINETICS).

### **Testosterone Levels**

Testosterone levels are often below the normal range in patients with end-stage renal disease. In a clinical study of CKD patients on dialysis, free testosterone levels decreased by a median of 31.3% in the cinacalcet treated patients and by 16.3% in the placebo-treated patients after 6 months of treatment. The clinical significance of these reductions in serum testosterone is unknown. An open label extension of this study showed no further reductions in free and total testosterone concentrations over a period of 3 years in cinacalcet-treated patients.

### **Laboratory Tests**

#### ***Patients with CKD and Secondary Hyperparathyroidism***

Serum calcium should be measured within 1 week and iPTH should be measured 1 to 4 weeks after initiation or dose adjustment of cinacalcet. Once the maintenance dose has been established, serum calcium should be measured approximately monthly, and PTH every 1 to 3 months (see DOSAGE AND ADMINISTRATION). Either the intact PTH (iPTH) or bio-intact PTH (biPTH) may be used to measure PTH levels; treatment with cinacalcet does not alter the relationship between iPTH and biPTH.

#### ***Patients with Parathyroid Carcinoma and Patients with Primary Hyperparathyroidism for Whom Parathyroidectomy is Not a Treatment Option***

Serum calcium should be measured within 1 week after initiation or dose adjustment of cinacalcet. Once maintenance dose levels have been established, serum calcium should be measured every 2 to 3 months (see DOSAGE AND ADMINISTRATION).

#### ***Interference with Laboratory and Diagnostic Tests***

None known.

### **Effects on Fertility**

Cinacalcet did not impair mating or fertility in rats at oral doses up to 75 mg/kg/day, with systemic exposures up to 2 times human exposure at the maximum recommended clinical dose (MRCD), based on AUC.

Studies in monkeys showed that cinacalcet depressed serum testosterone concentrations by 70-90% at oral doses 5-100 mg/kg/day, corresponding to systemic exposures 0.1-1 times the clinical exposure, on an AUC basis, at the MRCD of 360 mg/day. The highest dose also resulted in a 42% reduction in testicular weights.

### **Use in Pregnancy**

#### **Pregnancy Category: B3\***

Cinacalcet crossed the placental barrier in rabbits; foetal plasma cinacalcet concentrations were about 10 –13 % of the maternal plasma concentrations. There was no evidence of teratogenicity in rats or rabbits. Foetal body weights were decreased in rats at 50 mg/kg/day PO (approximately 2 times the clinical exposure at the MRCD, based on AUC) and increased incidences of unossified sternebrae occurred in rats at exposures 0.1 – 2 times the clinical exposure, with maternal toxicity.

There are no adequate and well-controlled studies of cinacalcet in pregnant women. Because animal reproduction studies are not always predictive of human response, cinacalcet should be used during pregnancy only if the potential benefit justifies the potential risk to the foetus.

\*Drugs which have been taken by only a limited number of pregnant women and women of childbearing age, without an increase in the frequency of malformation or other direct or indirect harmful effects on the human fetus having been observed. Studies in animals have shown evidence of an increased occurrence of fetal damage, the significance of which is considered uncertain in humans.

### **Use in lactation**

It is not known whether cinacalcet is excreted in human milk. Cinacalcet is excreted in the milk of lactating rats with a high milk to plasma ratio. Oral administration of cinacalcet to female rats during gestation and lactation at doses of 25 mg/kg/day and above (exposures at and above  $\geq 1.5$  times the clinical exposure at the MRCD, based on AUC) was associated with increases in neonatal loss and reduced body weight gain of suckling rats.

Considering the rat study findings and because many drugs are excreted in breast milk, a decision should be made to discontinue nursing or discontinue cinacalcet, taking into account the importance of cinacalcet to the mother.

### **Paediatric Use**

The safety and efficacy of cinacalcet in paediatric patients have not been established.

### **Use in the Elderly**

Of the 1136 patients enrolled in the cinacalcet phase 3 clinical programme, 26% were over 65 years old, and 9% were over 75 years old. No differences in the safety and efficacy of cinacalcet were observed in patients greater or less than 65 years of age (see DOSAGE AND ADMINISTRATION: Geriatric Patients).

### **Effects on Ability to Drive and Use Machines**

No effects on the ability to drive or operate machinery have been observed.

### **Carcinogenicity**

Cinacalcet, administered orally at dietary doses up to 200 mg/kg to mice and 35 mg/kg/day to rats for 104 weeks, showed no evidence of carcinogenic potential. These doses resulted in total systemic exposure (AUCs) approximately equivalent to the exposures observed in humans given the maximum dose of 360 mg/day. A decreased incidence of thyroid C-cell adenomas was observed in rats treated with cinacalcet.

### **Genotoxicity**

Cinacalcet was negative in the Ames assay, Chinese Hamster Ovary HGPT forward mutation assay, *in vitro* chromosome aberration assay and the mouse micronucleus assay. These tests indicate that cinacalcet is unlikely to pose a genotoxic risk to humans.

### **Interactions with other Medicines**

#### **Effect of Cinacalcet on Other Drugs**

Drugs metabolised by the enzyme cytochrome P450 2D6 (CYP2D6) – cinacalcet is an inhibitor of CYP2D6. Therefore, dose adjustments of concomitant medications may be required when cinacalcet is administered with medications that are predominantly metabolised by this enzyme (eg, metoprolol) and particularly those with a narrow therapeutic index (eg, flecainide, vinblastine, thioridazine and most tricyclic antidepressants).

Desipramine: Concurrent administration of 90 mg cinacalcet with 50 mg desipramine, a tricyclic antidepressant metabolised primarily by CYP2D6, increased desipramine exposure approximately 3.6 times in CYP2D6 extensive metabolisers.

Amitriptyline: Co-administration of 25 mg or 100 mg cinacalcet with 50 mg amitriptyline, a tricyclic antidepressant metabolised in part by CYP2D6, increased exposure to amitriptyline and its active metabolite nortriptyline by approximately 20% in extensive metabolisers of CYP2D6 enzymes. Dose reductions of amitriptyline may be required in some subjects receiving cinacalcet concurrently.

Drugs metabolised by other cytochrome P450 (CYP) enzymes - based on *in vitro* data, cinacalcet is not an inhibitor of other CYP enzymes at concentrations achieved clinically, including CYP1A2, CYP2C9, CYP2C19, and CYP3A4.

Warfarin: Multiple oral doses of cinacalcet did not affect the pharmacokinetics or pharmacodynamics (as measured by prothrombin time and the clotting factor VII) of warfarin.

The lack of effect of cinacalcet on the pharmacokinetics of R- and S-warfarin and the absence of auto-induction upon multiple dosing in patients indicates that cinacalcet is not an inducer of CYP3A4, CYP1A2 or CYP2C9 in humans.

Midazolam: Co-administration of cinacalcet (90 mg) with orally administered midazolam (2 mg), a CYP3A4 and CYP3A5 substrate, did not alter the pharmacokinetics of midazolam. These data suggest that cinacalcet would not affect the pharmacokinetics of those classes of drugs that are metabolised by CYP3A4 and CYP3A5, such as certain immunosuppressants, including cyclosporin and tacrolimus.

#### **Effect of Other Drugs on Cinacalcet**

Cinacalcet is metabolised by multiple cytochrome P450 enzymes, primarily CYP3A4, CYP1A2 and CYP2D6, which limit the potential for other drugs to increase cinacalcet concentrations.

Ketoconazole: Cinacalcet is metabolised in part by the enzyme CYP3A4. Co-administration of ketoconazole, a strong inhibitor of CYP3A4, caused an approximate 2-fold increase in cinacalcet exposure. Dose adjustment of cinacalcet may be required if a patient receiving cinacalcet initiates or discontinues therapy with a strong CYP3A4 inhibitor (eg, ketoconazole, erythromycin, itraconazole) or inducer (eg, rifampicin, phenytoin, St. John's Wort) of this enzyme.

Calcium carbonate: Co-administration of calcium carbonate (1500 mg) did not alter the pharmacokinetics of cinacalcet.

Sevelamer HCl: Co-administration of sevelamer HCl (2400 mg tid) did not alter the pharmacokinetics of cinacalcet.

Pantoprazole: Co-administration of pantoprazole (2400 mg) did not alter the pharmacokinetics of cinacalcet.

## **ADVERSE EFFECTS**

Studies were conducted in patients with CKD receiving dialysis, and in patients with parathyroid carcinoma or primary HPT for whom parathyroidectomy is not a treatment option. Cinacalcet was safe and generally well tolerated. However, nausea and vomiting are very common adverse reactions.

### **Secondary Hyperparathyroidism in Patients with Chronic Kidney Disease**

In 3 double-blind placebo-controlled clinical trials, 1126 CKD patients on dialysis received study drug (656 cinacalcet, 470 placebo) for up to 6 months. Adverse events reported during the studies were typical for the dialysis patient population. The most frequently reported adverse events (incidence of at least 5% in the cinacalcet group) are provided in Table 3. The most frequently reported events in the cinacalcet group were nausea and vomiting which were generally mild to moderate in severity, brief in duration, and infrequently led to discontinuation of study drug. Rash and hypocalcaemia have been observed.

**Table 3. Adverse Event Reported (at least 5%) in Patients Receiving Dialysis**

Body system and preferred terms	Percent of reports	
	Cinacalcet n = 656	Placebo n = 470
<b>Body as a whole</b>		
Fever	7	10
Oedema peripheral	7	7
Fatigue	7	7
Asthenia	7	4
Pain chest (non-cardiac)	6	4
Access infection	5	4
<b>Cardiovascular</b>		
Hypotension	7	12
Hypertension	7	5
Thrombosis vascular access	6	7
<b>CNS / PNS</b>		
Headache	16	17
Dizziness	10	8
<b>Gastrointestinal</b>		
Nausea	31	19
Vomiting	27	15
Diarrhoea	21	20
Pain abdominal	12	14
Dyspepsia	8	8
Anorexia	6	4
<b>Musculo-skeletal</b>		
Myalgia	15	14
Pain limb	9	10
Arthralgia	7	9
<b>Respiratory</b>		
Infection upper respiratory	12	13
Dyspnoea	9	9
Cough	6	7
<b>Skin and appendages</b>		
Pruritus	6	7

The incidence of serious adverse events (29 % vs 31%) and deaths (2% vs 3%) was similar in the cinacalcet and placebo groups, respectively.

**12-Month Experience with Cinacalcet**

Two hundred and sixty-six patients from the 2 pivotal phase 3 studies continued to receive cinacalcet or placebo treatment in a 6-month double-blind extension study (12-month total treatment duration). The incidence and nature of adverse events in this study were similar in the 2 treatment groups, and comparable to those observed in the pivotal phase 3 studies.

### **Post Marketing Data**

Spontaneous post marketing reports have been received describing diarrhoea, myalgia, rash and hypersensitivity reactions, including angioedema and urticaria, in association with cinacalcet HCl administration.

Isolated idiosyncratic cases of hypotension and/or worsening of heart failure have been reported in cinacalcet-treated patients with impaired cardiac function in post marketing safety surveillance.

Common: between 1% and 10%; uncommon: between 0.1% and 1%; rare: between 0.01% and 0.1%; very rare: between 0.001% and 0.01%).

Immune system disorders  
Uncommon: hypersensitivity reactions

Skin and subcutaneous tissue disorders  
Common: rash  
Very rare: angioedema and urticaria

Gastrointestinal disorders  
Rare: diarrhoea

Musculo-skeletal and connective tissue disorders  
Rare: myalgia

### **Laboratory Values**

Serum calcium levels should be monitored in patients receiving cinacalcet (see PRECAUTIONS and DOSAGE AND ADMINISTRATION). In the three phase 3 studies in patients with CKD receiving dialysis, 4% of all serum calcium values in patients receiving cinacalcet were below 1.88 mmol/L, compared with less than 1% in the placebo group.

### **Parathyroid Carcinoma and Primary HPT for Whom Parathyroidectomy is not a Treatment Option**

Overall, the safety profile in patients with parathyroid carcinoma or intractable primary HPT was similar to that seen in patients with CKD and secondary HPT. The most frequent adverse events in this patient group were nausea and vomiting. Since this study was an open-label, single-arm design, it was difficult to discern whether events of nausea and vomiting were related to the underlying hypercalcaemia or to cinacalcet treatment in this patient population.

## **DOSAGE AND ADMINISTRATION**

Sensipar<sup>®</sup> is administered orally. It is recommended that Sensipar<sup>®</sup> be taken with food or shortly after a meal. Tablets should be taken whole and should not be divided.

### **Patients with End Stage Renal Disease Receiving Dialysis**

Sensipar<sup>®</sup> reduces PTH while simultaneously lowering Ca x P, calcium and phosphorus levels in patients receiving dialysis.

The recommended starting dose for adults is 30 mg once per day.

Sensipar<sup>®</sup> should be titrated every 2 to 4 weeks to a maximum dose of 180 mg once daily to achieve a target PTH between 15.9 and 31.8 pmol/L (150-300 pg/mL)..

In CKD patients, PTH levels should be assessed at least 12 hours after dosing with cinacalcet.

During dose titration, serum calcium levels should be monitored frequently and if serum calcium levels decrease below the normal range, appropriate steps should be taken to increase serum calcium levels (see PRECAUTIONS).

### **Parathyroid Carcinoma and Primary HPT for Whom Parathyroidectomy is not a Treatment Option**

The recommended starting dose of Sensipar<sup>®</sup> for adults is 30 mg twice daily.

The dosage of Sensipar® should be titrated every 2 to 4 weeks through sequential doses of 30 mg twice daily, 60 mg twice daily, 90 mg twice daily, and 90 mg three or four times daily as necessary to normalise serum calcium.

### **Special Populations**

#### ***Geriatric patients***

Age does not alter the pharmacokinetics of cinacalcet; no dosage adjustment is required for geriatric patients.

#### ***Patients with renal impairment***

Renal impairment does not alter the pharmacokinetics of cinacalcet; no dosage adjustment is necessary for renal impairment.

#### ***Patients with hepatic impairment***

Moderate to severe hepatic impairment (Child-Pugh classification) increases cinacalcet drug concentrations by approximately 2 to 4 fold. In patients with moderate-severe hepatic impairment, PTH and serum calcium concentrations should be closely monitored during dose titration of cinacalcet.

### **OVERDOSAGE**

Doses titrated up to 300 mg once daily have been safely administered to patients receiving dialysis. Overdosage of cinacalcet may lead to hypocalcaemia. In the event of overdosage, patients should be monitored for signs and symptoms of hypocalcaemia and appropriate measures taken to correct serum calcium levels (see PRECAUTIONS).

Since cinacalcet is highly protein bound, haemodialysis is not an effective treatment for overdosage of cinacalcet.

### **PRESENTATION AND STORAGE CONDITIONS**

Sensipar® 30 mg tablets are formulated as light green, film-coated, oval-shaped tablets marked with "AMG" on one side and "30" on the opposite side, packaged in blister packs of 28 tablets.

Sensipar® 60 mg tablets are formulated as light green, film-coated, oval-shaped tablets marked with "AMG" on one side and "60" on the opposite side, packaged in blister packs of 28 tablets.

Sensipar® 90 mg tablets are formulated as light green, film-coated, oval-shaped tablets marked with "AMG" on one side and "90" on the opposite side, packaged in blister packs of 28 tablets.

Store below 30°C.

### **MEDICINE CLASSIFICATION**

Prescription Medicine

### **NAME AND ADDRESS OF THE SPONSOR**

Amgen (New Zealand) Limited  
Level 20, Lumley Centre  
88 Shortland Street  
Auckland  
New Zealand

Telephone +64 9 353 9700  
Fax +64 9 353 9701

Date of preparation : 30 September 2011

©2011 Amgen Inc. All rights reserved. Sensipar® is a registered trademark of Amgen.