

# CELEBREX<sup>®</sup>

celecoxib 100mg, 200mg and 400mg Capsules

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## Presentation

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100 mg Capsules: Opaque, white capsules with 2 blue bands marked 7767 and 100.

200 mg Capsules: Opaque, white capsules with 2 gold bands marked 7767 and 200.

400 mg Capsules: Opaque, white capsules with 2 green bands marked 7767 and 400.

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## Uses

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### Actions

#### Pharmacotherapeutic Group: M01AH Coxibs.

Celecoxib is a member of a class of agents which has a mechanism of action that inhibits prostaglandin synthesis primarily by inhibition of cyclooxygenase 2 (COX-2). At therapeutic concentrations in humans celecoxib does not inhibit cyclooxygenase 1 enzyme (COX-1). COX-2 is induced in response to inflammatory stimuli. This leads to the synthesis and accumulation of inflammatory prostanoids, in particular prostaglandin E2, causing inflammation, oedema and pain. In animal models, celecoxib acts as an anti-inflammatory, analgesic and anti-pyretic agent by blocking the production of inflammatory prostanoids via COX-2 inhibition. *In-vivo* and *ex-vivo* studies show that celecoxib has a very low affinity for the constitutively expressed COX-1. Consequently at therapeutic doses celecoxib has no effect on prostanoids synthesised by activation of COX-1 thereby not interfering with normal COX-1 related physiological processes in tissues, particularly the stomach, intestine and platelets.

### Clinical Trials

#### Osteoarthritis (OA)

CELEBREX has demonstrated significant reduction in joint pain compared to placebo. CELEBREX was evaluated for treatment of the signs and the symptoms of OA of the knee and hip in approximately 4,200 patients in placebo- and active-controlled clinical trials of up to 12 weeks duration. In patients with OA, treatment with CELEBREX 100 mg BD or 200 mg once daily resulted in improvement in WOMAC (Western Ontario and McMaster Universities) osteoarthritis index, a composite of pain, stiffness, and functional measures in OA. In three 12-week studies of pain accompanying OA flare, CELEBREX doses of 100 mg BD and 200 mg BD provided significant reduction of pain within 24-48 hours of initiation of dosing.

At doses of 100 mg BD or 200 mg BD the effectiveness of CELEBREX was shown to be similar to that of naproxen 500 mg BD. Doses of 200 mg BD provided no additional benefit above that seen with 100 mg BD. A total daily dose of 200 mg has been shown to be equally effective whether administered as 100 mg BD or 200 mg once daily.

### Rheumatoid Arthritis (RA)

CELEBREX has demonstrated significant reduction in joint tenderness/pain and joint swelling compared to placebo. CELEBREX was evaluated for treatment of the signs and symptoms of RA in approximately 2,100 patients in placebo- and active-controlled clinical trials of up to 24 weeks in duration. CELEBREX was shown to be superior to placebo in these studies, using the ACR20 Responder Index, a composite of clinical, laboratory, and functional measures in RA. CELEBREX doses of 100 mg BD and 200 mg BD were similar in effectiveness and both were comparable to naproxen 500 mg BD. Although CELEBREX 100 mg BD and 200 mg BD provided similar overall effectiveness, some patients derived additional benefit from the 200 mg BD dose. Doses of 400 mg BD provided no additional benefit above that seen with 100-200 mg BD.

### Ankylosing Spondylitis (AS)

CELEBREX has been investigated in 896 patients in placebo and active (diclofenac, naproxen or ketoprofen) controlled clinical trials of 6 weeks (one trial) and 12 weeks (three trials) duration for the symptomatic treatment of Ankylosing Spondylitis. At doses of 100 mg twice daily (BD), 200 mg once daily (OD), and 400 mg once daily (OD), CELEBREX was statistically superior to placebo for all measures of efficacy including global pain intensity, global disease activity and functional impairment. In two 12 week studies of celecoxib at 200 mg total daily dose and 400 mg total daily dose, non-inferiority was demonstrated relative to diclofenac 150 mg total daily dose for global pain intensity. Results for global pain intensity are presented below.

**Table 1: Global pain intensity<sup>a</sup> in CELEBREX ankylosing spondylitis clinical trials**

Study	Placebo	Celecoxib 200 mg TDD <sup>b</sup>	Celecoxib 400 mg TDD <sup>b</sup>	Ketoprofen 100 mg BD	Naproxen 500 mg BD	Diclofenac 150 mg TDD <sup>b</sup>
<b>Study 193</b> Week 12	N=156 - 9.9	N=137 - 30.0*	N=161 -30.4*	-- --	N=157 - 36.3*	-- --
<b>Study 137</b> Week 6	N=76 - 11.9	N=80 - 25.7*	-- --	N=90 - 22.5	-- --	-- --
<b>Study 243</b> Week 12	-- --	N=126 - 29.1**	N=124 -31.7**	-- --	-- --	N=123 - 32.7
<b>Study 247</b> Week 12	-- --	N=107 - 25.8**	N=108 -30.6**	-- --	-- --	N=115 -28.2

\* Statistically significant difference vs. placebo ( $p < 0.01$ ), based on Analysis of Covariance model with the effects of treatment and centre, and baseline value as covariate. Differences between celecoxib 200 mg TDD and celecoxib 400 mg TDD were not statistically significant.

\*\* Differences compared to diclofenac were not statistically significant ( $p > 0.50$ ), based on Analysis of Covariance model (for Study 243, baseline value and age as covariates and treatment, gender and centres as factors; for Study 247, baseline value as a covariate and treatment and centres as factors. Differences between celecoxib 200 mg TDD and celecoxib 400 mg TDD were not statistically significant.

<sup>a</sup> As measured using 100 mm Visual Analog Scale. All values represent least squares mean changes from baseline to the end of treatment, with last observation carried forward for patients who withdrew prior to the end of treatment.

<sup>b</sup> TDD = Total daily dose: celecoxib 200 mg TDD was administered as 100 mg twice daily (Study 137) or 200 mg once daily

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(Studies 193, 243, and 247); celecoxib 400 mg TDD was administered as 200 mg twice daily (Study 243 and 247) or 400 mg once daily (study 193); diclofenac 150 mg TDD was administered as Sustained Release 75 mg twice daily in Study 243, or 50 mg three times daily in Study 247.

## **Analgesia, including Dysmenorrhea**

In acute analgesic models of post-oral surgery pain, post-orthopaedic surgery pain, and primary dysmenorrhea, CELEBREX relieved pain that was rated by patients as moderate to severe. Single doses of CELEBREX provided pain relief within 30-60 minutes. In replicate multiple dose studies of post-orthopaedic surgery pain, Celebrex was effective in reducing pain without additional analgesic medication.

## **Special Studies**

### **Celecoxib Long-term Arthritis Safety Study (CLASS)**

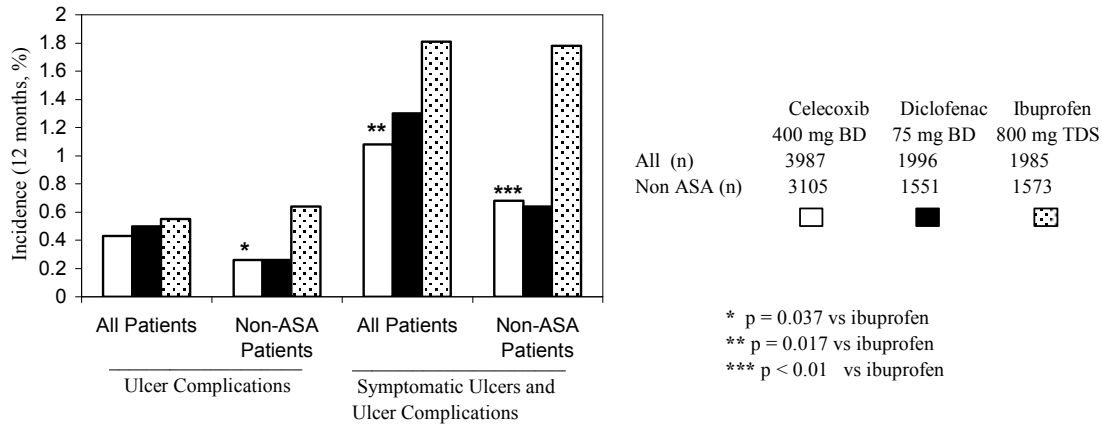
#### Study Design

A prospective long-term outcome study was conducted in approximately 5,800 OA patients and 2,200 RA patients. The primary endpoint of this outcome study was the incidence of *complicated ulcers* (gastrointestinal bleeding, perforation or obstruction) in CELEBREX treated patients compared to each comparator. Patients received CELEBREX 400 mg BD (4-fold and 2-fold greater than the recommended OA and RA doses, respectively), ibuprofen 800 mg TDS (approved maintenance dose is 1600 mg daily) or diclofenac 75 mg BD (approved maintenance dose is 75-100 mg daily) for a median exposure of 9 months for CELEBREX and diclofenac, and 6 months for ibuprofen. Patients were allowed to take concomitant low-dose aspirin  $\leq$ 325 mg mostly for cardiovascular prophylaxis.

#### Study Results

No statistically significant differences were demonstrated for the incidence of complicated ulcers among the three treatment groups in all patients. In an additional non-protocol specified analysis, there was no difference in the incidence of *complicated and symptomatic ulcers* in patients on CELEBREX vs. those on diclofenac, although the incidence was significantly lower for CELEBREX than for ibuprofen in all patients, and in those patients not taking aspirin (ASA) (Figure 1). Approximately 22% of patients were taking low-dose aspirin. Concomitant low-dose aspirin use increased the risk of complicated and symptomatic ulcers on CELEBREX, diclofenac and ibuprofen (see **Special Studies, Use with Aspirin**). The incidence rates for diclofenac may be underestimated because of a higher incidence of early withdrawals due to GI adverse events than CELEBREX and ibuprofen.

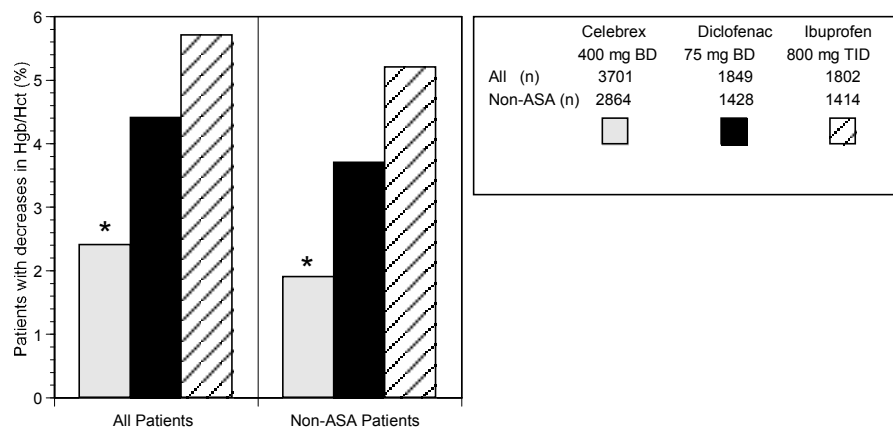
**Figure 1: Incidence of symptomatic ulcers and ulcer complications**



CELEBREX (4-fold and 2-fold greater than the recommended OA and RA doses, respectively) was also associated with a significantly lower incidence of clinically relevant decreases in haemoglobin (>20 g/L) or haematocrit (≥10 points) than ibuprofen and diclofenac regardless of aspirin use (Figure 2).

The incidence of clinically relevant decreases in haemoglobin and haematocrit in CELEBREX patients taking aspirin was lower than in ibuprofen and diclofenac patients taking aspirin.

**Figure 2: Incidence of clinically relevant decreases in haemoglobin and/or haematocrit**



\*p<0.05 CELEBREX vs ibuprofen and diclofenac

## Upper Gastrointestinal Complications

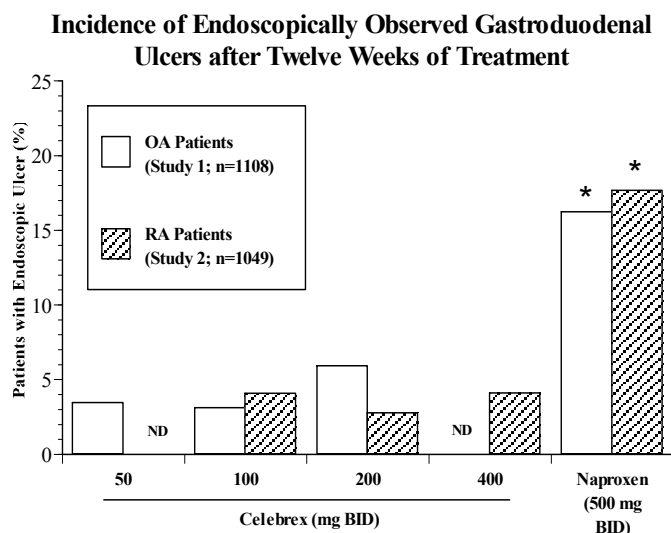
In the original registration studies, the incidence of serious upper gastrointestinal complications (bleeding, perforation, gastric outlet obstruction) with CELEBREX was not significantly different from placebo and is approximately 8-fold less than with non-specific COX inhibitors.

## Endoscopic Studies

Scheduled upper GI endoscopic evaluations were performed in over 4,500 arthritis patients who were enrolled in five controlled randomised 12-24 week trials using active comparators, two of which also included placebo controls. Twelve-week endoscopic ulcer data are available on approximately 1,400 patients and 24-week endoscopic ulcer data are available on 184 patients on CELEBREX at doses ranging from 50-400 mg BD. In all three studies that included naproxen 500 mg BD, and in the study that included ibuprofen 800 mg TDS, CELEBREX was associated with a statistically significantly lower incidence of endoscopic ulcers over the study period. Two studies compared CELEBREX with diclofenac 75 mg BD; one study revealed a statistically significantly higher prevalence of endoscopic ulcers in the diclofenac group at the study endpoint (6 months on treatment), and one study revealed no statistically significant difference between cumulative endoscopic ulcer incidence rates in the diclofenac and CELEBREX groups after 1, 2, and 3 months of treatment. There was no consistent relationship between the incidence of gastroduodenal ulcers and the dose of CELEBREX over the range studied.

Figure 3 and Table 2 summarise the incidence of endoscopic ulcers in two 12-week studies that enrolled patients in whom baseline endoscopies revealed no ulcers.

**Figure 3:**



ND = Not Done

\* Significantly different from all other treatments;  $p < 0.05$ .

CELEBREX 100 mg BD, 200 mg once daily or 200 mg BD are the recommended doses.

These studies were not powered to compare the endoscopic ulcer rates of CELEBREX vs. placebo.

Study 1: placebo ulcer rate = 2.3%

Study 2: placebo ulcer rate = 2.0%

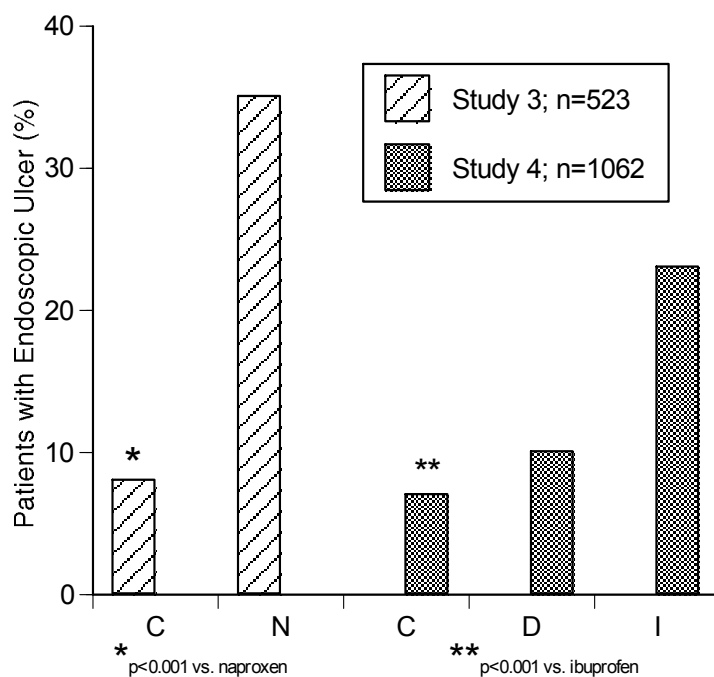
**Table 2: Incidence of gastroduodenal ulcers from endoscopic studies in OA and RA patients**

	3 Month Studies	
	Study 1 (n = 1108)	Study 2 (n= 1049)
Placebo	2.3% (5/217)	2.0% (4/200)
CELEBREX 50 mg BD	3.4% (8/233)	
CELEBREX 100 mg BD	3.1% (7/227)	4.0% (9/223)
CELEBREX 200 mg BD	5.9% (13/221)	2.7% (6/219)
CELEBREX 400 mg BD		4.1% (8/197)
Naproxen 500 mg BD	16.2% (34/210)*	17.6% (37/210)*

\*p≤ 0.05 vs all other treatments

Figure 4 and Table 3 summarise data from two 12-week studies that enrolled patients in whom baseline endoscopies revealed no ulcers. Patients underwent interval endoscopies every 4 weeks to give information on ulcer risk over time

**Figure 4: Cumulative incidence of gastroduodenal ulcers based on 4 serial endoscopies over 12 weeks**



C = CELEBREX 200 mg BD      D = Diclofenac 75 mg BD  
 N = Naproxen 500 mg BD      I = Ibuprofen 800 mg TDS

**Table 3: Incidence of gastroduodenal ulcers from 3-month serial endoscopy studies in OA and RA patients**

	Week 4	Week 8	Week 12	Final
<b>Study 3 (n=523)</b>				
<b>CELEBREX 200 mg BD</b>	4.0% (10/252)*	2.2% (5/227)*	1.5% (3/196)*	7.5% (20/266)*
<b>Naproxen 500 mg BD</b>	19.0% (47/247)	14.2% (26/182)	9.9% (14/141)	34.6% (89/257)
<b>Study 4 (n=1062)</b>				
<b>CELEBREX 200 mg BD</b>	3.9% (13/337)†	2.4% (7/296)†	1.8% (5/274)†	7.0% (25/356)†
<b>Diclofenac 75 mg BD</b>	5.1% (18/350)	3.3% (10/306)	2.9% (8/278)	9.7% (36/372)
<b>Ibuprofen 800 mg TDS</b>	13.0% (42/323)	6.2% (15/241)	9.6% (21/219)	23.3% (78/334)

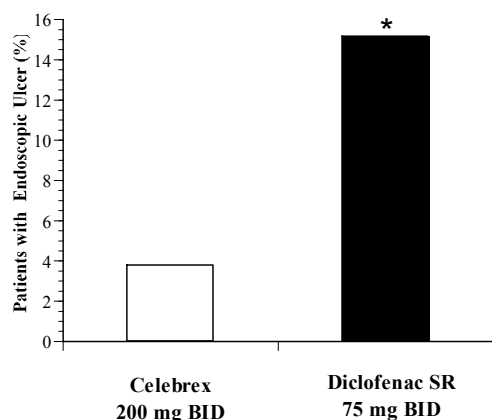
\* p≤ 0.05 CELEBREX vs. naproxen based on interval and cumulative analyses

†p≤ 0.05 CELEBREX vs. ibuprofen based on interval and cumulative analyses

One randomised and double-blinded 6-month study in 430 RA patients was conducted in which an endoscopic examination was performed at 6 months. The results are shown in Figure 5.

**Figure 5:**

**Prevalence of Endoscopically Observed Gastroduodenal Ulcers after Six Months of Treatment in Patients with Rheumatoid Arthritis**



\* Significantly different from Celebrex; p<0.001

The correlation between findings of endoscopic studies, and the relative incidence of clinically serious upper GI events that may be observed with different products, has not been fully established. Serious clinically significant upper GI bleeding has been observed in patients receiving CELEBREX in controlled and open-labelled trials, albeit infrequently. Among 5,285 patients who received CELEBREX in the original arthritis controlled clinical trials of 1 to 6 months duration (most were 3 month studies) at a daily dose of 200 mg or

more, 2 patients (0.04%) experienced significant UGI bleeding. Patients most at risk of developing an ulcer complication were the elderly ( $\geq 75$  years), patients in poor health or with cardiovascular disease, aspirin users and patients with a history of a GI ulcer or upper GI bleeding.

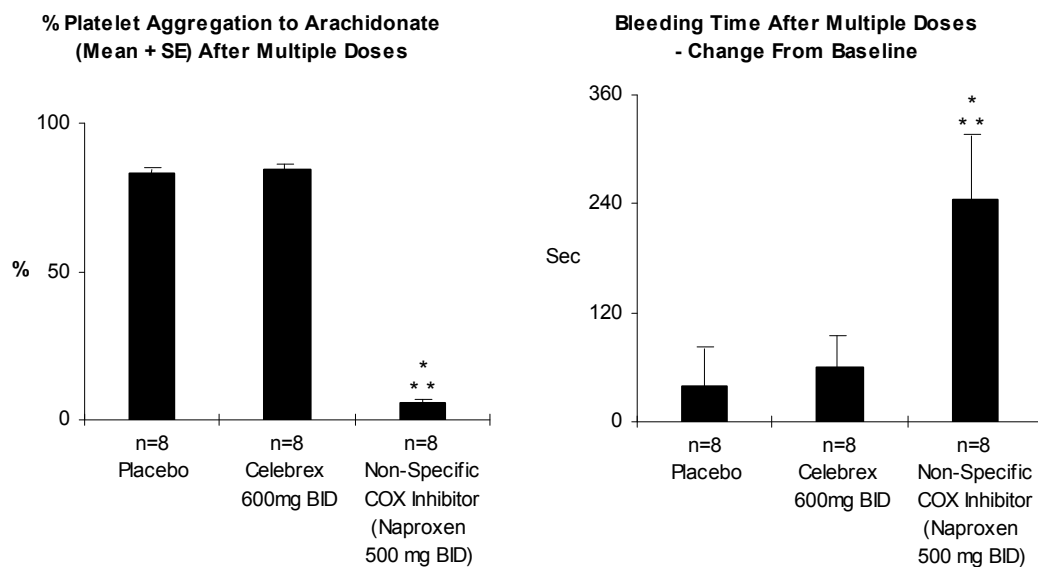
### Use with Aspirin

Approximately 11% of patients (440/4,000) enrolled in 4 of the 5 endoscopic studies were taking aspirin ( $\leq 325$  mg/day). In the CELEBREX groups, the endoscopic ulcer rate appeared to be higher in aspirin users than in non-users. However, the increased rate of ulcers in these aspirin users was less than the endoscopic ulcer rates observed in the active comparator groups, with or without aspirin.

### Platelet Function

At total daily doses of 1200 mg (three times the highest recommended therapeutic dose) for up to 7 days duration, CELEBREX had no effect on platelet aggregation and bleeding time compared to placebo. Active controls (non-specific COX inhibitors ie naproxen, diclofenac, ibuprofen) all significantly reduced platelet aggregation and prolonged bleeding time.

**Figure 6:**



\* Significantly different from placebo;  $p < 0.05$

\*\* Significantly different from CELEBREX;  $p < 0.05$

### Gastrointestinal Safety - Meta-Analysis from Osteoarthritis and Rheumatoid Arthritis Studies

An analysis of 31 randomised controlled clinical studies in osteoarthritis and rheumatoid arthritis, involving 39,605 patients with osteoarthritis (N = 25,903), rheumatoid arthritis (N = 3,232) or patients with either condition (N = 10,470) compared the incidence of GI adverse events in celecoxib treated patients with placebo or NSAIDs (including naproxen, diclofenac and ibuprofen). The incidence of clinical ulcers and ulcer bleeds with celecoxib 200-400 mg total daily dose was 0.2% compared with an incidence of 0.6% with NSAIDs (RR = 0.35; 95% CI 0.22-0.56).

## **Cardiovascular Safety - Long-Term Studies Involving Patients with Sporadic Adenomatous Polyps**

Two studies involving patients with sporadic adenomatous polyps were conducted with celecoxib i.e., the APC trial (Adenoma Prevention with Celecoxib) and the PreSAP trial (Prevention of Spontaneous Adenomatous Polyps). In the APC trial, there was a dose-related increase in the composite endpoint of cardiovascular death, myocardial infarction, or stroke (adjudicated) with celecoxib compared to placebo over 3 years of treatment. The PreSAP trial did not demonstrate a statistically significant increased risk for the same composite endpoint.

In the APC trial, the hazard ratios compared to placebo for a composite endpoint of cardiovascular death, myocardial infarction, or stroke (adjudicated) were 3.4 (95% CI 1.4-8.5) with celecoxib 400 mg twice daily and 2.8 (95% CI 1.1-7.2) with celecoxib 200 mg twice daily (cumulative rates for this composite endpoint over 3 years were 20/671 subjects, 3.0%, and 17/685 subjects, 2.5%, respectively, compared to 6/679 subjects, 0.9%, for placebo). The increases for both celecoxib dose groups versus placebo were mainly driven by myocardial infarction.

In the PreSAP trial, the hazard ratio compared to placebo for this same composite endpoint was 1.2 (95% CI 0.6-2.4) with celecoxib 400 mg once daily (cumulative rates for this composite endpoint over 3 years were 21/933 subjects, 2.3%, compared to 12/628 subjects, 1.9%, for placebo).

When data from the APC and PreSAP trials were considered together, risk for cardiovascular thromboembolic events was greater in celecoxib-treated patients with a history of atherosclerotic cardiovascular disease, than in celecoxib-treated patients without such history.

## **Cardiovascular Safety – Long-Term Study of Alzheimer's Disease Anti-inflammatory Prevention Trial (ADAPT)**

Data from a third long-term study, ADAPT (The Alzheimer's Disease Anti-inflammatory Prevention Trial), did not show a significantly increased cardiovascular risk with celecoxib 200 mg BID compared to placebo. The relative risk compared to placebo for a similar composite endpoint (CV death, MI, stroke) was 1.14 (95% CI 0.61 – 2.12) with celecoxib 200 mg twice daily. The incidence of myocardial infarction was 1.1% (8/717 patients) with celecoxib 200 mg twice daily and 1.2% (13/1070 patients) with placebo.

## **Cardiovascular Safety - Meta-analysis from Chronic Usage Studies**

No long-term controlled clinical study specifically designed to assess the CV safety of chronic celecoxib dosing of any duration has been conducted. However, a meta-analysis of safety data from 41 completed celecoxib clinical studies of up to 1 year in duration has been conducted, representing 44,308 patients (24,933 (56.3%) patients exposed to celecoxib, 13,990 (31.6%) patients exposed to NSAIDs, 4057 (9.2%) patients exposed to placebo, and 1328 (3.0%) patients exposed to rofecoxib).

In this analysis, the incidence of serious cardiovascular thromboembolic events (CV death, non-fatal myocardial infarction and non-fatal stroke) was similar between CELEBREX (N=19,773) and non-selective NSAID (N=13,990) treatment (RR=0.84, 95% CI 0.63-1.13). This pattern of effect was maintained with or without aspirin use ( $\leq$ 325 mg). The incidence of non-fatal myocardial infarction trended higher (RR=1.49, 95% CI 0.82-2.70); however that of stroke was significantly lower (RR= 0.31, 95% CI 0.14-0.68), and that of cardiovascular

death was comparable (RR=0.72, 95% CI 0.37-1.39) for CELEBREX compared to combined non-selective NSAIDs.

In this analysis, the incidence of serious cardiovascular thromboembolic events (CV death, non-fatal myocardial infarction and non-fatal stroke) was 0.38% for celecoxib (N=7462) and 0.27% for placebo (N=4,057) treatment (RR=1.14, 95% CI 0.57-2.27). This pattern of effect was maintained with or without aspirin use ( $\leq 325$  mg). The incidence of non-fatal myocardial infarction trended higher (RR=1.24, 95% CI 0.27-5.76), as did that of cardiovascular death (RR=1.74, 95% CI 0.49-6.17), and that of stroke was similar RR=0.96, 95% CI 0.29-3.17) for celecoxib compared to placebo.

### **Cardiovascular Safety - CLASS Trial**

Cardiovascular safety outcomes were evaluated in the CLASS trial (see **Special Studies, Celecoxib Long-term Arthritis Safety Study (CLASS)** for description of trial). Kaplan-Meier cumulative rates for investigator-reported serious cardiovascular thromboembolic adverse events (including MI, pulmonary embolism, deep venous thrombosis, unstable angina, transient ischemic attacks, and ischemic cerebrovascular accidents) demonstrated no differences between the celecoxib, diclofenac, or ibuprofen treatment groups. The cumulative rates in all patients at nine months for celecoxib, diclofenac, and ibuprofen were 1.2 %, 1.4 %, and 1.1 %, respectively. The cumulative rates in non-ASA users at nine months in each of the three treatment groups were less than 1 %. The cumulative rates for myocardial infarction in non-ASA users at nine months in each of the three treatment groups were less than 0.2 %. There was no placebo group in the CLASS trial, which limits the ability to determine whether the three drugs tested had no increased risk of CV events or if they all increased the risk to a similar degree.

## **Pharmacokinetics**

### **Absorption**

When celecoxib is given under fasting conditions, peak plasma concentrations are reached after approximately 2-3 hours. Under fasting conditions, both peak plasma levels ( $C_{max}$ ) and area under the curve (AUC) are roughly dose proportional up to 200 mg BD; at higher doses there are less than proportional increases in  $C_{max}$  and AUC (see **Pharmacokinetics, Food Effects**). Absolute bioavailability studies have not been conducted because of celecoxib's low solubility in aqueous media. The relative oral solubility of CELEBREX capsules compared with a suspension is about 99%. With multiple dosing, steady state conditions are reached on or before day 5.

### **Food Effects**

When CELEBREX capsules were taken with a high fat meal, peak plasma levels were delayed for about 1 to 2 hours with an increase in total absorption (AUC) of 10% to 20%. Under fasting conditions, at doses above 200 mg, there is less than a proportional increase in  $C_{max}$  and AUC, which is thought to be due to the low solubility of the drug in aqueous media. Coadministration of CELEBREX with an aluminium- and magnesium-containing antacid resulted in a reduction in plasma celecoxib concentrations with a decrease of 37% in  $C_{max}$  and 10% in AUC. In arthritis patients, CELEBREX, at doses up to 200 mg BD can be administered without regard to the timing of meals.

## Distribution

In healthy subjects, celecoxib is highly protein bound (~97%) within the therapeutic dose range. *In-vitro* studies indicate that it binds primarily to albumin, and to a lesser extent,  $\alpha_1$  glycoprotein. The apparent volume of distribution at steady state is about 400 L in healthy young adults, suggesting extensive tissue distribution.

## Metabolism

Celecoxib is extensively metabolised in the liver. *In-vitro* and *in-vivo* studies indicate that metabolism is mainly by cytochrome P450 2C9 (see **Interactions**). Three metabolites have been identified in human plasma, a primary alcohol, the corresponding carboxylic acid and its glucuronide conjugate. Pharmacological activity resides in the parent drug. The main metabolites found in human plasma have no detectable COX-1 or COX-2 inhibitory activity.

Cytochrome P450 2C9 activity is reduced in individuals with genetic polymorphisms that lead to reduced enzyme activity, such as those homozygous for the CYP 2C9\*3 polymorphism. In a pharmacokinetic study of celecoxib 200 mg administered once daily in healthy volunteers, genotyped as either CYP 2C9\*1/\*1, CYP 2C9\*1/\*3, or CYP 2C9\*3/\*3, the median C<sub>max</sub> and AUC 0-24 of celecoxib on day 7 were approximately 4-fold and 7-fold, respectively, in subjects genotyped as CYP 2C9\*3/\*3 compared to other genotypes. In three separate single dose studies, involving a total of 5 subjects genotyped as CYP 2C9\*3/\*3, single-dose AUC 0-24 increased by approximately 3-fold compared to normal metabolisers. It is estimated that the frequency of the homozygous \*3/\*3 genotype is 0.3-1.0% among different ethnic groups.

Patients who are known or suspected to be poor P450 2C9 metabolizers based on previous history should be administered CELEBREX with caution as they may have abnormally high plasma concentrations due to reduced metabolic clearance. Consider starting treatment at half the lowest recommended dose (see **Dosage and Administration** and **Interactions**).

## Elimination

Celecoxib is eliminated predominantly by hepatic metabolism with little (<3%) unchanged drug recovered in the urine and faeces. Following a single oral dose of radio labelled drug, approximately 57% of the dose was excreted in the faeces and 27% was excreted into the urine. The primary metabolite in both the urine and faeces was the carboxylic acid metabolite (73% of the dose) with low amounts of the glucuronide also appearing in the urine. At steady state the elimination half-life ( $t_{1/2}$ ) was 4-15 hours and the clearance is about 500 mL/min. It appears that the low solubility of the drug prolongs absorption resulting in variable terminal half-life ( $t_{1/2}$ ) determinations.

## Hepatic Impairment

A pharmacokinetic study in subjects with mild (Child-Pugh Class I) and moderate (Child-Pugh Class II) hepatic impairment has shown that steady-state celecoxib AUC is increased about 40% and 180%, respectively, above that seen in healthy control subjects. Therefore, CELEBREX capsules should be introduced at the lowest recommended dose in arthritis patients with moderate hepatic impairment.

Patients with severe hepatic impairment have not been studied. Therefore, the use of CELEBREX in patients with severe hepatic impairment (Child-Pugh score  $\geq 10$ ) is contraindicated (see **Contraindications** and **Dosage and Administration**).

## Renal Impairment

In elderly volunteers with age related reductions in glomerular filtration rate (GFR) (mean GFR > 65 ml/min/1.73m<sup>2</sup>) and in patients with chronic stable renal insufficiency (GFR 35-60 ml/min/1.73m<sup>2</sup>) celecoxib pharmacokinetics were comparable to those seen in patients with normal renal function. No significant relationship was found between serum creatinine (or creatinine clearance) and celecoxib clearance. Severe renal insufficiency would not be expected to alter clearance of celecoxib since the main route of elimination is via hepatic metabolism to inactive metabolites. There are no studies in patients with severe renal impairment.

## Elderly Subjects

At steady state, subjects older than 65 years of age had a 40% higher C<sub>max</sub> and a 50% higher AUC than those of younger subjects. In elderly females, the C<sub>max</sub> and AUC were higher than those for elderly males predominantly due to the lower body weight of the females. No dosage adjustment in the elderly is generally necessary. However, for elderly patients with a body weight of less than 50 kg treatment should be initiated at the lowest recommended dose.

## Children

CELEBREX is not approved for use in patients under 18 years of age.

## Race

Meta-analysis of pharmacokinetic studies has suggested an approximately 40% higher AUC of celecoxib in Blacks compared to Caucasians. The cause and clinical significance of this finding is unknown.

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## Indications

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Symptomatic treatment of pain and inflammation in osteoarthritis, rheumatoid arthritis and ankylosing spondylitis.

For the management of acute pain and treatment of primary dysmenorrhea in adults.

The decision to prescribe a selective COX-2 inhibitor should only be made:

- if non-pharmacological interventions and simple analgesic therapies have been tried and found to lack analgesic efficacy or to have unacceptable adverse effects in the individual patient, and
- after assessment of the individual patient's overall risks

As the cardiovascular risks of the selective COX-2 inhibitors may increase with dose and duration of exposure, the shortest duration possible and the lowest effective daily dose should be used. Patients on long term treatment should be reviewed regularly, such as every three months, with regards to efficacy, risk factors and ongoing need for treatment.

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## Contraindications

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Known hypersensitivity to CELEBREX or any of the excipients contained in the CELEBREX capsules (see **Further Information**).

Demonstrated allergic-type reactions to sulphonamides.

CELEBREX should not be given to patients who have experienced asthma, urticaria, or allergic-type reactions after taking acetyl salicylic acid (ASA) or other non-steroidal anti-inflammatory drugs, including other COX-2 specific inhibitors. Severe, rarely fatal, anaphylactoid reactions to non-steroidal anti-inflammatory drugs have been reported in such patients (see **Warnings and Precautions-Anaphylactoid Reactions**).

CELEBREX should not be used with other non-steroidal anti-inflammatory drugs because of the absence of any evidence demonstrating synergistic benefits and the potential for additive adverse reactions.

CELEBREX is contraindicated for the peri-operative treatment of pain in patients undergoing coronary artery bypass graft (CABG) surgery (see **Precautions**).

CELEBREX is contraindicated in:

- Patients with unstable or significant established ischaemic heart disease, peripheral arterial disease and/or cerebrovascular disease (see **Precautions**).
- Patients with active peptic ulceration or gastrointestinal (GI) bleeding.
- Patients with estimated creatinine clearance <30 mL/min.
- Patients with congestive heart failure (NYHA II-IV).
- Patients with severe hepatic impairment (Child-Pugh<sup>#</sup> score ≥10; see **Pharmacokinetics and Dosage and Administration**).

<sup>#</sup> Child-Pugh is a classification of the severity of liver disease.

Parameter	Points assigned		
	1	2	3
Ascites	Absent	Slight	Moderate
Bilirubin (mg/dL)	<2	2-3	>3
Albumin (g/dL)	>3.5	2.8-3.5	<2.8
Prothrombin time (seconds over control)	<4	4-6	>6
INR	<1.7	1.7-2.3	>2.3
Encephalopathy	None	Grade1-2	Grade3-4

Modified Child-Pugh classification of the severity of liver disease according to the degree of ascites, the plasma concentrations of bilirubin and albumin, the prothrombin time, and the degree of encephalopathy. A total score of 5-6 is considered grade A (well-compensated disease); 7-9 is grade B (significant functional compromise); and 10-15 is grade C (decompensated disease). These grades correlate with one- and two-year patient survival: grade A - 100 and 85 percent; grade B - 80 and 60 percent; and grade C - 45 and 35 percent.

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## Warnings and Precautions

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### Cardiovascular Adverse Effects

#### Cardiovascular Thrombotic Events

COX-2 inhibitors (of which celecoxib is one) have been associated with an increased risk of cardiovascular and thrombotic adverse events (see **Clinical Trials, Cardiovascular Safety**).

All NSAIDs, both COX-2 selective and non-selective may cause an increased risk of serious cardiovascular thrombotic events. This risk may increase with duration of use.

Patients with known cardiovascular disease, history of atherosclerotic cardiovascular disease or risk factors for cardiovascular disease may be at greater risk.

Two large, controlled clinical trials of a different COX-2 selective inhibitor for the treatment of pain in the first 10-14 days following CABG surgery found an increased incidence of myocardial infarction and stroke. In the absence of comparable data with celecoxib, it may be assumed that patients at high risk of cardiovascular disease (including patients with diabetes, ischaemic heart disease, cardiac failure, hyperlipidaemia, hypertension, or smokers) who are undergoing any major surgery may face an increased risk of developing a cardiovascular event. Patients with significant risk factors for cardiovascular events should only be treated with celecoxib after careful consideration of the patient's overall risk and the potential risks and benefits of alternative analgesic therapies.

To minimize the potential risk for an adverse cardiovascular event in patients treated with celecoxib, the lowest effective dose should be used for the shortest duration possible (see **Dosage and Administration**).

Prescribers should inform the individual patient of the possible increased risks when prescribing celecoxib for patients at high risk of cardiovascular adverse events. Physicians and patients should remain alert for such events, even in the absence of previous cardiovascular symptoms. Patients should be informed about the signs and/or symptoms of serious cardiovascular toxicity and the steps to take if they occur. Celecoxib is not a substitute for cardiovascular prophylaxis because of its lack of effect on platelets; therefore, concurrent anti-platelet therapies should not be discontinued. There is no evidence that concurrent use of aspirin decreases the risk of cardiovascular adverse events associated with COX-2 inhibitors, including celecoxib.

#### Gastrointestinal Effects

Infrequently, serious gastrointestinal toxicity such as bleeding, ulceration, and perforation of the stomach or intestine has been observed in patients treated with CELEBREX. Physicians and patients should remain alert for ulceration and bleeding, even in the absence of previous GI tract symptoms.

CELEBREX (celecoxib) exhibited a low incidence of gastroduodenal ulceration and serious clinically significant GI events within clinical trials (see **Clinical Trials, Special Studies**).

Serious GI toxicity, such as peptic ulceration, perforation and bleeding, sometimes severe and occasionally fatal, can occur at any time, with or without warning symptoms, in patients treated with non-steroidal anti-inflammatory drugs. Minor upper GI problems, such as

dyspepsia, are common, and may also occur at any time during NSAID therapy. Therefore, physicians should remain alert for ulceration and bleeding in patients treated with non-steroidal anti-inflammatory drugs, even in the absence of previous GI tract symptoms. Patients should be informed about the signs and/or symptoms of serious GI toxicity and the steps to take if they occur.

Only one in five patients who develop a serious upper GI adverse event on NSAID therapy is symptomatic. It has been demonstrated that upper GI ulcers, gross bleeding or perforation, caused by NSAIDs, appear to occur in approximately 1% of patients treated for 3-6 months, and in about 2-4% of patients treated for one year. These trends continue thus, increasing the likelihood of developing a serious GI event at some time during the course of therapy. However, even short-term therapy is not without risk. Most spontaneous reports of fatal GI events are in elderly or debilitated patients and therefore special care should be taken in treating this population.

NSAIDs should be prescribed with extreme caution in patients with a prior history of ulcer disease or gastrointestinal bleeding. Upper gastrointestinal perforations, ulcers or bleeds have occurred in patients treated with celecoxib.

Most spontaneous reports of fatal GI events are in elderly or debilitated patients and therefore special care should be taken in treating this population. To minimise the potential risk of an ulcer complication, the lowest effective dose of CELEBREX should be used for the shortest possible duration. For high risk patients, alternate therapies that do not involve NSAIDs should be considered.

Studies have shown that patients with a prior history of peptic ulcer disease and/or gastrointestinal bleeding and who use NSAIDs, have a greater than 10-fold higher risk for developing a GI bleed than patients with neither of these risk factors. It is unclear how this finding applies to CELEBREX. In addition to a past history of ulcer disease, pharmacoepidemiological studies have identified several other co-therapies or co-morbid conditions that may increase the risk for GI bleeding such as: treatment with oral corticosteroids, treatment with anticoagulants, longer duration of NSAID therapy, smoking, alcoholism, older age, and poor general health status.

There is further increase in the risk of gastrointestinal adverse effects (gastrointestinal ulceration or other gastrointestinal complications), when celecoxib is taken concomitantly with aspirin (even at low doses).

In patients on concurrent therapy with warfarin or similar agents, serious bleeding events have been reported. Because increases in prothrombin time (INR) have been reported, anti-coagulant activity should be monitored after initiating treatment with celecoxib or changing the dose. If INR increases, it may be sufficient to reduce the dose of warfarin in order to manage the interaction.

There is no definitive evidence that the concomitant administration of histamine H<sub>2</sub>-receptor antagonists and/or antacids will either prevent the occurrence of gastrointestinal side effects or allow the continuation of CELEBREX if these adverse reactions appear.

### **Anaphylactoid Reactions**

As with NSAIDs in general, anaphylactoid reactions have occurred in patients without known prior exposure to CELEBREX. In post-marketing experience, rare cases of anaphylactoid

reactions and angiodema have been reported in patients receiving CELEBREX. CELEBREX should not be given to patients with the aspirin triad. This symptom complex typically occurs in asthmatic patients who experience rhinitis with or without nasal polyps, or who exhibit severe, potentially fatal bronchospasm after taking aspirin or other NSAIDs (see **Contraindications** and **Warnings and Precautions, Pre-existing Asthma**). Emergency help should be sought in cases where an anaphylactoid reaction occurs.

### **Serious Skin Reactions**

Serious skin reactions, some of them fatal, including exfoliative dermatitis, Stevens-Johnson syndrome, and toxic epidermal necrolysis, have been reported very rarely in association with the use of celecoxib. Patients appear to be at highest risk for these events early in the course of therapy: the onset of the event occurring in the majority of the cases within the first month of treatment. CELEBREX should be discontinued at the first appearance of skin rash, mucosal lesions, or any other sign of hypersensitivity.

### **Hypertension**

As with all NSAIDs, celecoxib can lead to the onset of new hypertension or worsening of pre-existing hypertension, either of which may contribute to the increased incidence of cardiovascular events. NSAIDs, including celecoxib, should be used with caution in patients with hypertension. Blood pressure should be monitored closely during the initiation of therapy with celecoxib and throughout the course of therapy.

### **Renal Effects**

Long-term administration of NSAIDs has resulted in renal papillary necrosis and other renal injury. Renal toxicity has also been seen in patients in whom renal prostaglandins have a compensatory role in the maintenance of renal perfusion. In these patients, administration of a non-steroidal anti-inflammatory drug may cause a dose-dependent reduction in prostaglandin formation and, secondarily, in renal blood flow, which may precipitate overt renal decompensation. Such patients should be carefully monitored while receiving treatment with celecoxib. Patients at greatest risk of this reaction are those with impaired renal function, heart failure, liver dysfunction, those taking diuretics and ACE-inhibitors (see **Warnings and Precautions-Concomitant Use of ACE-inhibitors or Angiotensin Receptor Antagonists and Anti-inflammatory Drugs and Thiazide Diuretics**), and the elderly. Discontinuation of NSAID therapy is usually followed by recovery to the pre-treatment state.

Clinical trials with CELEBREX have shown renal effects similar to those observed with comparator NSAIDs. At the present time the relative roles of COX-1 and COX-2 in renal physiology is incompletely understood. Celecoxib reduces the urinary excretion of PGE<sub>2</sub> and 6-keto-PGF<sub>1 $\alpha$</sub>  (a prostacyclin metabolite) but leaves serum thromboxane B<sub>2</sub> (TXB<sub>2</sub>) and urinary excretion of 11-dehydro-TXB<sub>2</sub>, a thromboxane metabolite (both COX-1 products) unaffected.

Caution should be used when initiating treatment with CELEBREX in patients with considerable dehydration. It is advisable to rehydrate patients first and then start therapy with CELEBREX.

No information is available regarding the use of CELEBREX in patients with advanced kidney disease. Therefore, treatment with CELEBREX is not recommended in these patients. If CELEBREX therapy must be initiated, close monitoring of the patient's kidney function is advisable.

### **Concomitant use of ACE-inhibitors or Angiotensin Receptor Antagonists and Anti-inflammatory Drugs and Thiazide Diuretics**

The use of an ACE inhibiting drug (ACE-inhibitor or angiotensin receptor antagonist), and an anti-inflammatory drug (NSAID or COX-2 inhibitor) and a thiazide diuretic at the same time, increases the risk of renal impairment. This includes use in fixed-combination products containing more than one class of drug. Concomitant use of all three classes of these medications should be accompanied by increased monitoring of serum creatinine, particularly at the initiation of the treatment. The concomitant use of drugs from these three classes should be used with caution particularly in elderly patients or those with pre-existing renal impairment.

### **Use with Other NSAIDs**

The concomitant use of celecoxib and a non-aspirin NSAID should be avoided.

### **Hepatic Effects**

Borderline elevations of one or more liver tests may occur in up to 15% of patients taking NSAIDs, and notable elevations of ALT or AST (approximately three or more times the upper limit of normal) have been reported in approximately 1% of patients in clinical trials with NSAIDs. These laboratory abnormalities may progress, may remain unchanged, or may be transient with continuing therapy. Rare cases of severe hepatic reactions, including jaundice, fatal fulminant hepatitis, liver necrosis, hepatic failure (some with fatal outcome) and liver transplant have been reported with NSAIDs, including CELEBREX (see **Adverse Effects**). In controlled clinical trials of CELEBREX, the incidence of borderline elevations of liver tests was 6% for CELEBREX and 5% for placebo, and approximately 0.2% of patients taking CELEBREX and 0.3% of patients taking placebo had notable elevations of ALT and AST.

A patient with symptoms and/or signs suggesting liver dysfunction, or in whom an abnormal liver test has occurred, should be monitored carefully for evidence of the development of a more severe hepatic reaction while on therapy with CELEBREX. If clinical signs and symptoms consistent with liver disease develop, or if systemic manifestations occur (e.g. eosinophilia, rash, etc.), CELEBREX should be discontinued.

The incidence of elevations in ALT and/or AST may be increased in patients treated with celecoxib at doses greater than 400 mg daily.

### **Haematological Effects**

Anaemia is sometimes seen in patients receiving CELEBREX. In controlled clinical trials the incidence of anaemia was 0.6% with CELEBREX and 0.4% with placebo. Patients on long-term treatment with CELEBREX should have their haemoglobin or haematocrit checked if they exhibit any signs or symptoms of anaemia or blood loss. CELEBREX does not generally affect platelet counts, prothrombin time (PT), or partial thromboplastin time (PTT),

and does not appear to inhibit platelet aggregation at indicated dosages (see **Clinical Trials, Special Studies, Platelet Function**).

### **Pre-existing Asthma**

Patients with asthma may have aspirin-sensitive asthma. The use of aspirin in patients with aspirin-sensitive asthma has been associated with severe bronchospasm which can be fatal. Since cross reactivity, including bronchospasm, between aspirin and other non-steroidal anti-inflammatory drugs has been reported in such aspirin-sensitive patients, CELEBREX should not be administered to patients with this form of aspirin sensitivity and should be used with caution in patients with pre-existing asthma.

### **Fluid Retention and Oedema**

Fluid retention and oedema have been observed in some patients taking CELEBREX (see **Adverse Effects**). As with all NSAIDs, celecoxib may exacerbate pre-existing hypertension, cardiac failure or oedema, and the treatment of these conditions may be compromised. Therefore, CELEBREX should be used with caution in patients with fluid retention, hypertension, heart failure, compromised cardiac function, pre-existing oedema or other conditions predisposing to, or worsened by, fluid retention including those taking diuretic treatment or otherwise at risk of hypovolaemia. Patients with pre-existing congestive heart failure or hypertension should be closely monitored.

### **Use in Patients being Treated with Corticosteroids**

Abrupt discontinuation of corticosteroids may lead to exacerbation of corticosteroid-responsive illness. Patients on prolonged corticosteroid therapy should have their therapy tapered slowly if a decision is made to discontinue corticosteroids.

### **Use in Patients with Inflammatory Bowel Disease (IBD)**

Short-term exposure of celecoxib to patients with ulcerative colitis (UC) in remission has not shown an exacerbation of IBD in spondyloarthropathies, but the implications of longer term exposure remain unknown. NSAIDs have been associated with an exacerbation of IBD associated with spondyloarthropathies.

### **Detecting Infections**

By reducing inflammation, celecoxib may diminish the utility of diagnostic signs, such as fever, in detecting infections.

### **Carcinogenicity/Mutagenicity**

Celecoxib was not carcinogenic in 2-year studies in rats given oral doses up to 200 mg/kg/day for males and 10 mg/kg/day for females (approximately 2-4 fold the human exposure as measured by the  $AUC_{0-24\text{ h}}$  at 400 mg BD, which is twice the recommended maximum daily dose), or in mice given dietary doses up to 25 mg/kg/day for males and 50 mg/kg/day for females (slightly less than human exposure as measured by the  $AUC_{0-24\text{ h}}$  at 400 mg BD).

Celecoxib was not mutagenic in an Ames test and a mutation assay in Chinese hamster ovary (CHO) cells, nor clastogenic in a chromosome aberration assay in CHO cells and an *in-vivo* micronucleus test in rat bone marrow.

### **Impairment of Fertility**

Celecoxib did not affect male or female fertility in rats at oral doses up to 600 mg/kg/day (approximately 7-fold human exposure based on  $AUC_{0-24\text{ h}}$  at 400 mg BD, which is twice the recommended maximum daily dose).

### **Pregnancy and Lactation**

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

There is no information on the use of celecoxib in pregnant women. CELEBREX use is not recommended in pregnancy unless it is considered clinically essential (see **information on animal studies**). No studies have been done to evaluate the effect of celecoxib on the closure of the ductus arteriosus in humans. In animal studies, both COX-1 and COX-2 have been shown to be present in the ductus arteriosus of foetal lambs and to contribute to maintenance of patency. Therefore, use of CELEBREX during the third trimester of pregnancy should be avoided and CELEBREX should not be used during the first and second trimesters of pregnancy unless the potential benefit to the mother justifies the potential risk to the foetus. The effects of CELEBREX on labour and delivery in pregnant women are not known.

In rats, celecoxib caused early embryonic death at doses greater than 30 mg/kg/day administered before mating and during early gestation (approximately 2-fold human exposure based on  $AUC_{0-24\text{ h}}$  at 400 mg BD, which is twice the recommended maximum daily dose). This effect is attributable to inhibition of prostaglandin production, and is not associated with permanent alteration of reproductive function. Celecoxib was shown to cross the placenta in rats. Teratology studies disclosed an increased incidence of wavy ribs in one study in rats dosed at 100 mg/kg/day, increased incidences of diaphragmatic hernias at 30 and 100 mg/kg/day in another rat study; and increased incidences of rib and sternebral abnormalities in rabbits at doses of 60 mg/kg/day or greater and cardiovascular abnormalities in rabbits at doses of 150 mg/kg/day or greater. At the no-effect dose in rats (10 mg/kg/day),  $AUC_{0-24\text{ h}}$  was similar to that in humans dosed at 400 mg BD. At the threshold dose of 60 mg/kg/day in rabbits,  $AUC_{0-24\text{ h}}$  was slightly below that in humans dosed at 400 mg BD. Celecoxib had a marginal effect on parturition, causing slight prolongation of gestation and parturition and increased incidence of still births at oral doses of 10 mg/kg/day or greater (slightly greater than human exposure based on  $AUC_{0-24\text{ h}}$  at 400 mg BD).

#### **Use in Lactation**

Studies in rats show that celecoxib is excreted in milk at concentrations similar to those in plasma. Administration of celecoxib to lactating women has shown very low transfer of celecoxib into breast milk. Because of the potential for adverse reactions to celecoxib in nursing infants, a decision should be made whether to discontinue nursing or to discontinue the drug, taking into account the expected benefit of the drug to the mother.

## Effects on Ability to Drive and use Machines

The effect of CELEBREX on ability to drive or use machinery has not been studied, but based on its pharmacodynamic properties and overall safety profile it is unlikely to have an effect.

## Other

### Use in the Elderly

Of the total number of patients who received CELEBREX in clinical trials, more than 3,300 were 65-74 years of age, while approximately 1,300 additional patients were 75 years and over. While the incidence of adverse experiences tended to be higher in elderly patients, no substantial differences in safety and effectiveness were observed between these subjects and younger subjects. Other reported clinical experience including data from Celecoxib Long-Term Arthritis Safety Study has not identified differences in response between the elderly and younger patients, but greater sensitivity of some older individuals cannot be ruled out. In clinical studies comparing renal function as measured by the GFR, BUN (Blood Urea Nitrogen) and creatinine, and platelet function as measured by bleeding time and platelet aggregation, the results were not different between elderly and young volunteers.

### Use in Children

CELEBREX is not approved for use in patients under 18 years of age.

### Laboratory Tests

Because serious GI tract ulcerations and bleeding can occur without warning symptoms, physicians should monitor for signs or symptoms of GI bleeding.

During the controlled clinical trials, there was an increased incidence of hyperchloremia in patients receiving celecoxib compared with patients on placebo. Other laboratory abnormalities that occurred more frequently in the patients receiving celecoxib included hypophosphatemia, and elevated BUN. These laboratory abnormalities were also seen in patients who received comparator NSAIDs in these studies. The clinical significance of these abnormalities has not been established.

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## Interactions

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### General

Celecoxib metabolism is predominantly mediated via cytochrome P450 2C9 in the liver. Patients who are known or suspected to be poor CYP 2C9 metabolisers based on previous history/experience with other CYP 2C9 substrates should be administered celecoxib with caution as they may have abnormally high plasma levels due to reduced metabolic clearance. Co-administration of celecoxib with drugs that are known to inhibit 2C9 should be done with caution. Consider starting treatment at half the lowest recommended dose (see **Dosage and Administration**).

*In-vitro* studies indicate that celecoxib, although not a substrate, is an inhibitor of cytochrome P450 2D6. Therefore, there is a potential for an *in-vivo* drug interaction with drugs that are metabolised by P450 2D6.

### **ACE-inhibitors and Angiotensin II Antagonists**

Reports suggest that NSAIDs may diminish the antihypertensive effect of Angiotensin Converting Enzyme (ACE) inhibitors and/or angiotensin II antagonists. This interaction should be given consideration in patients taking CELEBREX concomitantly with ACE-inhibitors and/or angiotensin II antagonists.

In patients who are elderly, volume-depleted (including those on diurectic therapy), or with compromised renal function, co-administration of NSAIDs, including selective COX-2 inhibitors, with ACE inhibitors, may result in deterioration of renal function, including possible acute renal failure. These effects are usually reversible.<sup>†</sup>

### **Frusemide**

Clinical studies, as well as post marketing observations, have shown that NSAIDs can reduce the natriuretic effect of furosemide and thiazides in some patients. This response has been attributed to inhibition of renal prostaglandin synthesis.

### **Aspirin**

CELEBREX can be used with low dose aspirin. However, concomitant administration of aspirin with CELEBREX may result in an increased rate of GI ulceration or other complications, compared to use of CELEBREX alone (see **Clinical Trials, Special Studies, Upper Gastrointestinal Complications**). Because of its lack of platelet effects, CELEBREX is not a substitute for aspirin for cardiovascular prophylaxis.

### **Fluconazole**

Concomitant administration of fluconazole at 200 mg once daily resulted in a two-fold increase in celecoxib plasma concentration. This increase is due to the inhibition of celecoxib metabolism via P450 2C9 by fluconazole (see **Pharmacokinetics, Metabolism**). CELEBREX should be introduced at the lowest recommended dose in patients receiving fluconazole.

### **Lithium**

In a study conducted in healthy subjects, mean steady-state lithium plasma levels increased approximately 17% in subjects receiving lithium 450 mg BD with CELEBREX 200 mg BD as compared to subjects receiving lithium alone. Patients on lithium treatment should be closely monitored when CELEBREX is introduced or withdrawn.

### **Oral Hypoglycaemics**

The effect of celecoxib on the pharmacokinetics and/or pharmacodynamics of glibenclamide and tolbutamide has been studied and clinically important interactions have not been found.

## Glucocorticoids

Oral glucocorticoids should be used with caution since they increase the risk of GI side effects such as ulceration and bleeding. This is especially the case in older (>65 years of age) individuals.

## Antacids

Coadministration of CELEBREX with an aluminium- and magnesium-containing antacid resulted in a reduction in plasma celecoxib concentrations with a decrease of 37% in  $C_{max}$  and 10% in AUC.

## Methotrexate

CELEBREX did not have a significant effect on the pharmacokinetics of methotrexate.

## Ketoconazole

CELEBREX did not have a significant effect on the pharmacokinetics of ketoconazole.

## Phenytoin

CELEBREX did not have a significant effect on the pharmacokinetics of phenytoin.

## Warfarin

In patients on concurrent therapy with warfarin or similar agents, serious bleeding events, some of them fatal, predominantly in elderly have been reported. Because increases in prothrombin time (INR) have been reported, anti-coagulant activity should be monitored after initiating treatment with celecoxib or changing the dose. If INR increases, it may be sufficient to reduce the dose of Warfarin in order to manage the interaction (see **Warning and Precautions-Gastrointestinal Effects**).

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## Adverse Effects

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Of the CELEBREX treated patients in controlled trials, approximately 4,250 were patients with OA, approximately 2,100 were patients with RA, and approximately 1,050 were patients with post-surgical pain. More than 8,500 patients have received a total daily dose of CELEBREX of 200 mg (100 mg BD or 200 mg once daily) or more, including more than 400 treated at 800 mg (400 mg BD). Approximately 3,900 patients have received CELEBREX at these doses for 6 months or more; approximately 2,300 of these have received it for 1 year or more and 124 of these have received it for 2 years or more.

Adverse events from original CELEBREX arthritis trials: Table 4 lists all adverse events, regardless of causality, occurring in  $\geq 2$  % of patients receiving CELEBREX from 12 controlled studies conducted in patients with OA or RA that included a placebo and/or an active control group.

**Table 4: Adverse events occurring in  $\geq 2\%$  of CELEBREX patients from original CELEBREX arthritis trials**

	<b>CELEBREX</b> (100-200 mg BD or 200 mg once daily) (N=4146)	<b>Placebo</b> (N=1864)	<b>Naproxen</b> 500 mg BD (N=1366)	<b>Diclofenac</b> 75 mg BD (N=387)	<b>Ibuprofen</b> 800 mg TDS (N=345)
<b>Gastrointestinal</b>					
Abdominal pain	4.1%	2.8%	7.7%	9.0%	9.0%
Diarrhoea	5.6%	3.8%	5.3%	9.3%	5.8%
Dyspepsia	8.8%	6.2%	12.2%	10.9%	12.8%
Flatulence	2.2%	1.0%	3.6%	4.1%	3.5%
Nausea	3.5%	4.2%	6.0%	3.4%	6.7%
<b>Body as a whole</b>					
Back Pain	2.8%	3.6%	2.2%	2.6%	0.9%
Peripheral oedema	2.1%	1.1%	2.1%	1.0%	3.5%
Injury-accidental	2.9%	2.3%	3.0%	2.6%	3.2%
<b>Central and peripheral nervous system</b>					
Dizziness	2.0%	1.7%	2.6%	1.3%	2.3%
Headache	15.8%	20.2%	14.5%	15.5%	15.4%
Psychiatric					
Insomnia	2.3%	2.3%	2.9%	1.3%	1.4%
<b>Respiratory</b>					
Pharyngitis	2.3%	1.1%	1.7%	1.6%	2.6%
Rhinitis	2.0%	1.3%	2.4%	2.3%	0.6%
Sinusitis	5.0%	4.3%	4.0%	5.4%	5.8%
Upper respiratory tract infection	8.1%	6.7%	9.9%	9.8%	9.9%
<b>Skin</b>					
Rash	2.2%	2.1%	2.1%	1.3%	1.2%

In placebo- or active-controlled clinical trials, the discontinuation rate due to adverse events was 7.1% for patients receiving CELEBREX and 6.1% for patients receiving placebo. Among the most common reasons for discontinuation due to adverse events in the CELEBREX treatment groups were dyspepsia and abdominal pain (cited as reasons for discontinuation in 0.8% and 0.7% of CELEBREX patients, respectively). Among patients receiving placebo, 0.6% discontinued due to dyspepsia and 0.6% withdrew due to abdominal pain.

The adverse event profile from a Celecoxib Long-term Arthritis Safety Study (at 4- and 2-fold the recommended doses for OA and RA, respectively) was similar to those reported in the arthritis controlled trials.

**The following adverse events occurred in 0.1-1.9% of patients taking CELEBREX (100-200 mg BD or 200 mg once daily) regardless of causality:**

<b>Gastrointestinal:</b>	Constipation, diverticulitis, dysphagia, eructation, oesophagitis, gastritis, gastroenteritis, gastroesophageal reflux, haemorrhoids, hiatal hernia, melaena, dry mouth, stomatitis, tenesmus, tooth disorder, vomiting
<b>Cardiovascular:</b>	Aggravated hypertension, hypertension, angina pectoris, coronary artery disorder, myocardial infarction*, heart failure, palpitations, arrhythmia
<b>General:</b>	Allergy aggravated, allergic reaction, asthenia, chest pain, cyst NOS, oedema generalized, face oedema, fatigue, fever, hot flushes, influenza-like symptoms, pain, peripheral pain
<b>Resistance mechanism disorders:</b>	Herpes simplex, herpes zoster, infection bacterial, infection fungal, infection soft tissue, infection viral, moniliasis, moniliasis genital, otitis media
<b>Central, peripheral nervous system:</b>	Leg cramps, hypertonia, hypoaesthesia, migraine, neuralgia, neuropathy, paraesthesia, vertigo
<b>Female reproductive:</b>	Breast fibroadenosis, breast neoplasm, breast pain, dysmenorrhoea, menstrual disorder, vaginal haemorrhage, vaginitis
<b>Male reproductive:</b>	Prostatic disorder
<b>Hearing and vestibular:</b>	Deafness, ear abnormality, earache, tinnitus
<b>Heart rate and rhythm:</b>	Palpitation, tachycardia
<b>Liver and biliary system:</b>	Hepatic function abnormal, AST increased, ALT increased
<b>Metabolic and nutritional:</b>	BUN increased, CPK increased, diabetes mellitus, hypercholesterolaemia, hyperglycaemia, hypokalaemia, non protein nitrogen increase, creatinine increased, alkaline phosphatase increased, weight increase
<b>Musculoskeletal:</b>	Arthralgia, arthrosis, bone disorder, fracture accidental, myalgia, neck stiffness, synovitis, tendonitis
<b>Platelets (bleeding or clotting):</b>	Ecchymosis, epistaxis, thrombocythaemia
<b>Psychiatric:</b>	Anorexia, anxiety, appetite increased, depression, nervousness, somnolence
<b>Hemic:</b>	Anaemia
<b>Respiratory:</b>	Bronchitis, bronchospasm, bronchospasm aggravated, coughing, dyspnoea, laryngitis, pneumonia
<b>Skin and appendages:</b>	Alopecia, dermatitis, nail disorder, photosensitivity reaction, pruritus, rash erythematous, rash maculopapular, skin disorder, skin dry, sweating increased, urticaria
<b>Application site disorders:</b>	Cellulitis, dermatitis contact, injection site reaction, skin nodule
<b>Special senses:</b>	Taste perversion
<b>Urinary system:</b>	Albuminuria, cystitis, dysuria, hematuria, micturition frequency, renal calculus, urinary incontinence, urinary tract infection
<b>Vision:</b>	Blurred vision, cataract, conjunctivitis, eye pain, glaucoma

## Other serious adverse events which occur rarely (<0.1%), regardless of causality:

The following serious adverse events have occurred rarely in patients, taking CELEBREX. Cases reported only in the post-marketing experience are indicated in *italics*.

<b>Cardiovascular:</b>	Syncope, congestive heart failure, ventricular fibrillation, pulmonary embolism, cerebrovascular accident, peripheral gangrene, thrombophlebitis, <i>vasculitis</i> , ischaemic stroke*, <i>cerebral haemorrhage</i>
<b>Gastrointestinal:</b>	Intestinal obstruction, intestinal perforation, gastrointestinal bleeding, colitis with bleeding, oesophageal perforation, pancreatitis, ileus, ulcers (oesophageal, gastric and duodenal)
<b>Liver and Biliary system:</b>	Cholelithiasis, <i>hepatitis, fulminant hepatitis jaundice, liver failure, liver necrosis, liver transplant</i> , elevation of hepatic enzymes.
<b>Haemic and lymphatic:</b>	Thrombocytopenia, <i>agranulocytosis, aplastic anaemia, pancytopenia, leukopenia</i>
<b>Metabolic:</b>	Hypoglycaemia
<b>Psychiatric:</b>	Hallucinations
<b>Nervous system:</b>	<i>Ageusia, anosmia, aseptic meningitis</i> , ataxia, suicide, aggravated epilepsy, confusion
<b>Reproductive system and breast disorders:</b>	<i>Menstrual disorders</i>
<b>Renal:</b>	<i>Acute renal failure, interstitial nephritis, hyponatraemia</i>
<b>Skin:</b>	<i>Erythema multiforme, exfoliative dermatitis, Stevens-Johnson syndrome, toxic epidermal necrolysis, drug rash with eosinophilia and systemic symptoms (DRESS, or hypersensitivity syndrome)<sup>†</sup></i>
<b>Ear:</b>	Decreased hearing
<b>Eye**:</b>	<i>Conjunctivitis</i>
<b>General:</b>	Sepsis, sudden death, <i>anaphylactoid reaction</i> , angioedema, bullous eruption

\*In a pooled analysis of 20 placebo-controlled studies with duration greater than 2 weeks up to 1 year in patients with OA and RA, the excess rate of myocardial infarction in patients treated with celecoxib 200 or 400 mg daily over placebo was 0.7 events per 1000 patients (Rare) and there was no excess of strokes.

In preliminary data from two studies in patients with colorectal polyps treated with celecoxib 400 mg daily (see **Clinical Trials, Cardiovascular Safety**) the excess rate over placebo of myocardial infarction over 3 years was 7 events per 1000 patients (Uncommon). In the same studies, the excess rate for clearly identified ischaemic stroke for the 400 mg daily dose (not including events that were haemorrhagic or of unknown aetiology) was 0.5 event per 1000 over 3 years (Rare). For all strokes, there was no increased event rate with celecoxib compared with placebo.

## Adverse Events from Analgesia and Dysmenorrhea Studies

Approximately 1,700 patients were treated with CELEBREX in analgesia and dysmenorrhea studies. All patients in post-oral surgery pain and dysmenorrhea studies received a single dose of study medication. Doses up to 600 mg/day were studied in primary dysmenorrhea and post-orthopedic surgery pain studies. The types of adverse events in the analgesia and dysmenorrhea studies were similar to those reported in arthritis studies. In approximately 700 patients treated with CELEBREX in the post-general and orthopedic surgery pain studies,

the most commonly reported adverse events were nausea, vomiting, headache, dizziness and fever.

**Adverse Events from Polyp Prevention Trials:** The following additional adverse events\* in Table 5 were reported at incidence rates greater than placebo in long-term polyp prevention studies of duration up to 3 years at daily doses from 400 mg up to 800 mg (see **Clinical Trials, Cardiovascular Safety**). Adverse events are listed by system organ class are ranked by frequency. Frequencies are defined as: very common (>10%), common (>1% and <10%), uncommon (>0.1% and <1%).

**Table 5: Adverse events occurring in CELEBREX patients from long-term studies involving patients with sporadic adenomatous polyps**

<b>System Organ Class</b> Frequency	<b>Adverse Drug Event</b>
<b>Infections and infestations</b> Common  Uncommon	Ear infection, fungal infection (primarily non-systemic) Helicobacter infection, herpes zoster, erysipelas, wound infection, gingival infection, labyrinthitis, bacterial infection
<b>Neoplasms benign, malignant, and unspecified</b> Uncommon	Lipoma
<b>Psychiatric disorders</b> Uncommon	Sleep disorder
<b>Nervous system disorders</b> Uncommon	Cerebral infarction
<b>Eye disorders</b> Uncommon	Vitreous floaters, conjunctival haemorrhage
<b>Ear and labyrinth disorders</b> Uncommon	Hypoacusis
<b>Cardiac disorders</b> Common Uncommon	Angina pectoris, myocardial infarction Angina unstable, aortic valve incompetence, coronary artery atherosclerosis, sinus bradycardia, ventricular hypertrophy
<b>Vascular disorders</b> Very Common Uncommon	Hypertension* Deep vein thrombosis, haematoma
<b>Respiratory, thoracic, and mediastinal disorders</b> Common Uncommon	Dyspnoea  Dysphonia
<b>Gastrointestinal disorders</b> Very Common Common	Diarrhoea* Nausea, gastro-oesophageal reflux disease, diverticulum, vomiting*, dysphagia, irritable bowel syndrome

Uncommon	Haemorrhoidal haemorrhage, frequent bowel movements, mouth ulceration, stomatitis
<b>Hepatobiliary disorders</b> Rare	Elevation of hepatic enzymes
Skin and subcutaneous tissue disorders Uncommon	Dermatitis allergic
<b>Musculoskeletal and connective tissue disorders</b> Common Uncommon	Muscle spasms Ganglion
<b>Renal and urinary disorders</b> Common Uncommon	Nephrolithiasis Nocturia
<b>Reproductive system and breast disorders</b> Common Uncommon	Benign prostatic hyperplasia, prostatitis Vaginal haemorrhage, breast tenderness, dysmenorrhoea, ovarian cyst, menopausal symptoms
<b>General disorders and administration site conditions</b> Uncommon	Oedema
<b>Investigations</b> Common  Uncommon	Blood creatinine increased, prostatic specific antigen increased, weight increased Blood potassium increased, blood sodium increased, blood testosterone decreased, haematocrit decreased, haemoglobin increased
<b>Injury, poisoning and procedural complications</b> Uncommon	Foot fracture, lower limb fracture, epicondylitis, tendon rupture, fracture

\*Hypertension, vomiting and diarrhoea are included in Table 5 because they were reported more frequently in these studies, which were of 3-year duration, compared to Table 4, which includes adverse events from studies of 12-week duration.

### Other Adverse Events

Intestinal anastomotic ulceration was observed in 3 of 58 patients enrolled in familial adenomatous polyposis clinical trials and who had prior intestinal surgery, one at 100 mg BD, and two at 400 mg BD.

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## Dosage and Administration

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All patients taking celecoxib should commence therapy at the lowest recommended dose, and be titrated to the lowest dose compatible with effective control of symptoms for the shortest possible period.

## Adults

The following doses can be given without regard to timing of meals.

**Osteoarthritis:** The recommended daily dose is 200 mg taken once daily or in two divided doses. A dose of 200 mg twice daily may be used if needed.

**Rheumatoid arthritis:** The recommended daily dose is 200-400 mg taken in two divided doses.

**Ankylosing spondylitis:** The recommended daily dose is 200 mg taken once daily or in two divided doses. Some patients may benefit from a total daily dose of 400 mg.

**Management of Acute Pain and Treatment of Primary Dysmenorrhea:** The recommended dose is 400 mg as a single dose on the first day followed by 200 mg once daily on subsequent days. Patients may be instructed to take an additional dose of 200 mg on any given day, if needed. The maximum recommended dose is 400 mg per day. CELEBREX can be administered up to 2 hours prior to surgery.

## Elderly

No dosage adjustment is generally necessary. However, for elderly patients with a lower than average body weight (<50 kg), it is advisable to initiate therapy at the lowest recommended dose.

## Hepatic impairment

No dosage adjustment is necessary in patients with mild hepatic impairment. In arthritis patients with moderate hepatic impairment, CELEBREX should be introduced at the lowest recommended dose. There is no clinical experience in patients with severe hepatic impairment. Therefore, the use of CELEBREX in patients with severe hepatic impairment (Child-Pugh score  $\geq 10$ ) is contraindicated (see **Pharmacokinetics** and **Contraindications**).

## Renal impairment

No dosage adjustment is necessary in patients with mild or moderate renal impairment. There is no clinical experience in patients with severe renal impairment (see **Pharmacokinetics** and **Warnings and Precautions**).

## Children

CELEBREX is not approved in patients under 18 years old.

## CYP 2C9 Poor Metabolisers

Patients who are known, or suspected to be CYP 2C9 poor metabolisers based on previous history/experience with other CYP 2C9 substrates should be administered celecoxib with caution. Consider starting treatment at half the lowest recommended dose (see **Interactions** and **Pharmacokinetics**).

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## Overdosage

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Clinical experience of overdose is limited. No overdoses of CELEBREX were reported during clinical trials. Doses up to 2400 mg/day for up to 10 days in 12 patients did not result in serious toxicity.

Symptoms following acute NSAID overdoses are usually limited to lethargy, drowsiness, nausea, vomiting, epigastric pain and other gastrointestinal adverse effects, which are generally reversible with supportive care. Gastrointestinal bleeding can occur. Hypertension, acute renal failure, respiratory depression and coma may occur, but are rare. Anaphylactoid reactions have been reported with therapeutic ingestion of NSAIDs, and may occur following an overdose.

There are no specific antidotes. Patients should be managed by symptomatic and supportive care following an NSAID overdose. Monitor patients for signs and symptoms of gastrointestinal ulceration and/or haemorrhage. Monitor serum electrolytes, renal function and urinalysis after significant overdose.

Consider activated charcoal in the event of a potentially toxic ingestion. Activated charcoal is most effective when administered within one or two hours of ingestion and may reduce absorption of the drug. In patients who are not fully conscious or have impaired gag reflex, consideration should be given to administering activated charcoal via a nasogastric tube, once the airway is protected.

No information is available regarding the removal of celecoxib by haemodialysis, but based on its high degree of plasma protein binding (>97%) dialysis is unlikely to be useful in overdose. Forced diuresis, alkalization of urine, haemodialysis, or haemoperfusion may not be useful due to high protein binding.

Contact the Poisons Information Centre for advice on the management of an overdose.

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## Pharmaceutical Precautions

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### Incompatibilities

Incompatibilities with other medicines - None known.

### Shelf Life

CELEBREX 100 mg, 200 mg and 400 mg capsules have a shelf-life of 36 months when stored in PVC/Aclar/Aluminium foil blisters or in PVC/Aluminium foil blisters, in an outer carton below 25°C.

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## Medicine Classification

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Prescription Only Medicine.

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## Package Quantities

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CELEBREX is available as:

100 mg capsules in cartons of 60's.

200 mg capsules in cartons of 30's.

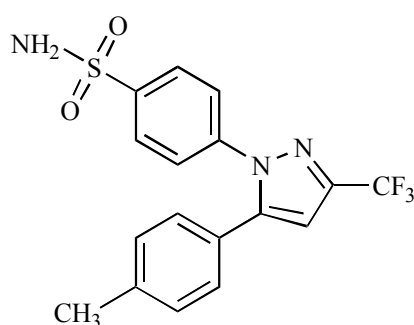
400 mg capsules in cartons of 30's.

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## Further Information

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The chemical structure of celecoxib is as shown below:



C<sub>17</sub>H<sub>14</sub>F<sub>3</sub>N<sub>3</sub>O<sub>2</sub>S

M.W. = 381.38

4-[5-(4-methylphenyl)-3-(trifluoromethyl)-1H-pyrazol-1-yl] benzenesulfonamide

CELEBREX 100 mg, 200 mg and 400 mg capsules contain lactose, sodium lauryl sulfate, povidone, croscarmellose sodium, and magnesium stearate. The capsule shells contain gelatin, titanium dioxide; and the inks contain: iron oxide yellow CI 77492 (200 mg and 400 mg capsule); indigo carmine CI 73015 (100 mg capsule); Brilliant Blue FCF CI 42090 Aluminium Lake (400 mg capsule).

Celecoxib is weakly acidic with a pKa in water of 11.1 and is practically insoluble in water. Celecoxib is chemically unrelated to anti-inflammatory agents of steroidal or non-steroidal nature. Celecoxib does not contain a chiral centre.

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## Name and Address

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Pfizer New Zealand Ltd  
PO Box 3998  
Auckland, NEW ZEALAND

Toll Free number: 0800 736 363

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## **Date of Preparation**

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29 December 2011

† Please note changes in Data Sheet

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