

**For the use of a Registered Medical Practitioner or a Hospital or a Laboratory only**

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**NORMABRAIN SYRUP**

**(Piracetam 500mg/5ml Syrup)**

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**COMPOSITION**

Each 5ml contains:

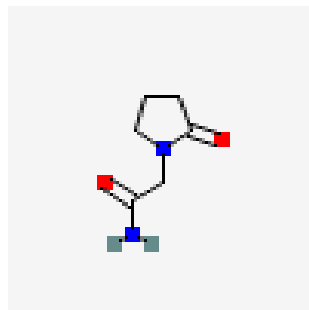
Piracetam I.P..... 500 mg

Flavoured syrupy base....q.s.

Colour: Erythrosine

**DESCRIPTION**

Piracetam, a neuroprotective agent, is chemically a 2-(2-Oxopyrrolidin-1-yl)acetamide. It has a empirical formula of  $C_6H_{10}N_2O_2$  and molecular weight of 142.2. The structure of piracetam is



**CLINICAL PHARMACOLOGY**

***Pharmacodynamics***

Piracetam's mode of action in cortical myoclonus is as yet unknown. Piracetam exerts its haemorrhheological effects on the platelets, red blood cells, and vessel walls by increasing erythrocyte deformability and by decreasing platelet aggregation, erythrocyte adhesion to vessel walls and capillary vasospasm.

**Effects on the red blood cells:**

In patients with sickle cell anemia, piracetam improves the deformability of the erythrocyte membrane, decreases blood viscosity, and prevents rouleaux formation.

**Effects on platelets:**

In open studies in healthy volunteers and in patients with Raynaud's phenomenon, increasing doses of piracetam up to 12 g was associated with a dose-dependent reduction in platelet functions compared with pre-treatment values (tests of aggregation induced by ADP, collagen, epinephrine and  $\beta$ TG release), without significant change in platelet count. In these studies, piracetam prolonged bleeding time.

**Effects on blood vessels:**

In animal studies, piracetam inhibited vasospasm and counteracted the effects of various spasmogenic agents. It lacked any vasodilatory action and did not induce "steal" phenomenon, nor low or no reflow, nor hypotensive effects.

In healthy volunteers, piracetam reduced the adhesion of RBCs to vascular endothelium and possessed also a direct stimulant effect on prostacycline synthesis in healthy endothelium.

**Effects on coagulation factors:**

In healthy volunteers, compared with pre-treatment values, piracetam up to 9.6 g reduced plasma levels of fibrinogen and von Willebrand's factors (VIII : C; VIII R : AG; VIII R : vW) by 30 to 40 %, and increased bleeding time.

In patients with both primary and secondary Raynaud phenomenon, compared with pre-treatment values, piracetam 8 g/d during 6 months reduced plasma levels of fibrinogen and von Willebrand's factors (VIII : C; VIII R : AG; VIII R : vW (RCF)) by 30 to 40 %, reduced plasma viscosity, and increased bleeding time

***Pharmacokinetic***

Piracetam is rapidly and almost completely absorbed. Peak plasma levels are reached within 1.5 hours after administration. The extent of oral bioavailability, assessed from the Area Under Curve (AUC), is close to 100% for capsules, tablets and solution. Peak levels and AUC are proportional to the dose given. The volume of distribution of piracetam is 0.7 L/kg, and the plasma half-life is 5.0 hours, in young adult men. Piracetam crosses the blood-brain and the placental barrier and diffuses across membranes used in renal dialysis. Up to now, no metabolite of piracetam has been found. Piracetam is excreted almost completely in urine and the fraction of the dose excreted in urine is independent of the dose given. Excretion half-life values are consistent with those calculated from

plasma / blood data. Clearance of the compound is dependent on the renal creatinine clearance and would be expected to diminish with renal insufficiency.

## **INDICATIONS**

NORMABRAIN is indicated for patients suffering from myoclonus of cortical origin, irrespective of aetiology, and should be used in combination with other anti-myoclonic therapies.

## **CONTRAINDICATION**

Piracetam is contra-indicated in patients with severe renal impairment (renal creatinine clearance of less than 20 ml per minute), hepatic impairment and to those under 16 years of age. It is also contraindicated in patients with cerebral haemorrhage, suffering from Huntington's Chorea and in those with hypersensitivity to piracetam, other pyrrolidone derivatives or any of the excipients.

## **WARNINGS AND PRECAUTIONS**

### ***Effects on platelet aggregation***

Due to the effect of piracetam on platelet aggregation, caution is recommended in patients with severe haemorrhage, patients at risk of bleeding such as gastrointestinal ulcer, patients with underlying disorders of haemostasis, patients with history of haemorrhagic CVA, patients undergoing major surgery including dental surgery, and patients using anticoagulants or platelet antiaggregant drugs including low dose aspirin

### ***Renal insufficiency***

Piracetam is eliminated via the kidneys and care should thus be taken in cases of renal insufficiency

### ***Elderly***

For long-term treatment in the elderly, regular evaluation of the creatinine clearance is required to allow dosage adaptation if needed

### ***Discontinuation***

Abrupt discontinuation of treatment should be avoided as this may induce myoclonic or generalised seizures in some myoclonic patients.

## **Carcinogenicity**

Single doses of piracetam yielded LD<sub>50</sub> values at 26 g/kg in mice but LD<sub>50</sub> values were not reached in rats. In dogs, clinical signs after acute oral dosing were mild and lethality was not observed at the maximum tested dose of 10 g/kg.

Repeated oral treatment for up to 1 year in dogs (10 g/kg) and 6 months in rats (2 g/kg) was very well tolerated: no target organ toxicity or signs of (irreversible) toxicity were clearly demonstrated. Safe dose levels represent a multiple of the maximum intended human daily dose of 0.4 g/kg.

In terms of exposure (C<sub>max</sub>) safe levels obtained in the rat and the dog represent respectively 8 fold and 50 fold of the maximum human therapeutic level. AUC levels obtained in the same animals were a multiple of the human AUC level at the maximum intended daily dose.

The only change which might eventually be attributed to chronic treatment in male, but not in female, rats was an increase of the incidence over control animals of progressive glomerulonephrosis at the dose of 2.4 g/kg/day given for 112 weeks.

Although piracetam crosses the placenta into the foetal circulation, no teratogenic effects were observed at dose levels up to 4.8 g/kg/day (mice, rats) and 2.7 g/kg/day (rabbits). Furthermore, the compound affects neither fertility nor the peri- or postnatal development of the pregnancy at doses up to 2.7 g/kg/day.

Piracetam was found to be devoid of any mutagenic or clastogenic activity and does not represent any genotoxic or carcinogenic risk to man.

## **DRUG INTERACTION**

### **Pharmacokinetics interactions**

The drug interaction potential resulting in changes of piracetam pharmacokinetics is expected to be low because approximately 90% of the dose of piracetam is excreted in the urine as unchanged drug.

*In vitro*, piracetam does not inhibit the human liver cytochrome P450 isoforms CYP 1A2, 2B6, 2C8, 2C9, 2C19, 2D6, 2E1 and 4A9/11 at concentrations of 142, 426 and 1422 µg/ml.

At 1422 µg/ml, minor inhibitory effects on CYP 2A6 (21%) and 3A4/5 (11%) were observed. However, the K<sub>i</sub> values for inhibition of these two CYP isoforms are likely to

be well in excess of 1422 µg/ml. Therefore, metabolic interaction of piracetam with other drugs is unlikely.

### **Thyroid hormones**

Confusion, irritability and sleep disorder have been reported during concomitant treatment with thyroid extract (T3 + T4).

### **Acenocoumarol**

In a published single-blind study on patients with severe recurrent venous thrombosis, piracetam 9.6 g/d did not modify the doses of acenocoumarol necessary to reach INR 2.5 to 3.5, but compared with the effects of acenocoumarol alone, the addition of piracetam 9.6 g/d significantly decreased platelet aggregation, β-thromboglobulin release, levels of fibrinogen and von Willebrand's factors (VIII : C; VIII : vW : Ag; VIII : vW : RCo) and whole blood and plasma viscosity.

### **Antiepileptic drugs**

A 20 g daily dose of piracetam over 4 weeks did not modify the peak and trough serum levels of antiepileptic drugs (carbamazepine, phenytoin, phenobarbitone, valproate) in epileptic patients who were receiving stable doses.

### **Alcohol**

Concomitant administration of alcohol had no effect on piracetam serum levels and alcohol levels were not modified by a 1.6 g oral dose of piracetam.

## **ADVERSE EFFECTS**

### ***Tabulated list of adverse reactions***

Undesirable effects reported in clinical studies and from post-marketing experience are listed in the following table per System Organ Class and per frequency. The frequency is defined as follows: very common ( $\geq 1/10$ ); common ( $\geq 1/100, < 1/10$ ); uncommon ( $\geq 1/1,000, < 1/100$ ); rare ( $\geq 1/10,000, < 1/1,000$ ); very rare ( $< 1/10,000$ ).

Data from post-marketing experience are insufficient to support an estimate of their incidence in the population to be treated.

### **Blood and Lymphatic disorders**

Not known: haemorrhagic disorder

### **Immune system disorders:**

Not known: anaphylactoid reaction, hypersensitivity

**Psychiatric disorders:**

Common: nervousness

Uncommon: depression

Not known: agitation, anxiety, confusion, hallucination

**Nervous system disorders:**

Common: hyperkinesia

Uncommon: somnolence

Not known: ataxia, balance impaired, epilepsy aggravated, headache, insomnia

**Ear and labyrinth disorders:**

Not known: vertigo

**Gastrointestinal disorders:**

Not known: abdominal pain, abdominal pain upper, diarrhoea, nausea, vomiting

**Skin and subcutaneous tissue disorders:**

Not known: angioneurotic oedema, dermatitis, pruritus, urticaria

**General disorders and administration site conditions:**

Uncommon: asthenia

**Investigations**

Common: weight increased

**OVERDOSAGE**

*Symptoms*

No additional adverse events specifically related to overdose have been reported with piracetam.

The highest reported overdose with piracetam was oral intake of 75 g. Bloody diarrhoea with abdominal pain, was most probably related to the extreme high dose of sorbitol contained in the used formulation.

*Management of overdose*

In acute, significant overdosage, the stomach may be emptied by gastric lavage or by induction of emesis. There is no specific antidote for overdose with piracetam. Treatment

for an overdose will be symptomatic treatment and may include hemodialysis. The extraction efficiency of the dialyser is 50 to 60% for piracetam.

## **DOSAGES AND ADMINISTRATION**

### ***Adults***

The dosage regime shows important interindividual variability, requiring an individualised dose finding approach. A reasonable protocol would be to introduce piracetam at a dosage of 7.2 g/day, increasing by 4.8 g/day every 3 to 4 days up to a maximum of 20g/day, given in either 2 or 3 divided doses while keeping other antiepileptic drugs unchanged at their optimal dosage. If possible, depending on clinical benefit, an attempt should be made to subsequently reduce the dosage of other antiepileptic drugs.

Once started, treatment with piracetam should be continued for as long as the original cerebral disease persists. In patients with an acute episode, spontaneous evolution may occur over time and an attempt should be made every 6 months to decrease or discontinue the medicinal treatment. This should be done by reducing the dose of piracetam by 1.2 g every two days (every three or four days in the case of a Lance and Adams syndrome, in order to prevent the possibility of sudden relapse or withdrawal seizures).

### ***Elderly***

Adjustment of the dose is recommended in elderly patients with compromised renal function (see 'Dosage adjustment in patients with renal impairment' below). For long term treatment in the elderly, regular evaluation of the creatinine clearance is required to allow dosage adaptation if needed.

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

The daily dose must be individualized according to renal function. Refer to the following table and adjust the dose as indicated. To use this dosing table, an estimate of the patient's creatinine clearance (CL<sub>cr</sub>) in ml/min is needed. The CL<sub>cr</sub> in ml/min may be estimated from serum creatinine (mg/dl) determination using the following formula:

$$Cl_{cr} = \frac{[140 - \text{age (years)}] \times \text{weight (kg)} (\times 0.85 \text{ for women})}{72 \times \text{serum creatinine (mg/dl)}}$$

Group	Creatinine Clearance (ml/min)	Posology and frequency
Normal	> 80	usual daily dose, 2 to 4 sub-doses
Mild	50-79	2/3 usual daily dose, 2 or 3 sub-doses
Moderate	30-49	1/3 usual daily dose, 2 sub-doses
Severe	< 30	1/6 usual daily dose, 1 single intake
End-stage renal disease	--	contraindicated

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

No dose adjustment is needed in patients with solely hepatic impairment. In patients with hepatic impairment and renal impairment, adjustment of dose is recommended (see 'Dosage adjustment in patients with renal impairment' above).

#### ***Method of administration***

Piracetam should be administered orally, and may be taken with or without food. It is recommended to take the daily dose in two to four sub-doses.

### **USE IN PREGNANCY, NURSING MOTHER, USE IN CHILDREN AND OLDER PATIENTS**

#### ***Pregnancy***

There are no adequate data from the use of piracetam in pregnant women. Animal studies do not indicate direct or indirect harmful effects with respect to pregnancy, embryonal / foetal development, parturition or post-natal development (see section 5.3).

Piracetam crosses the placental barrier. Drug levels in the newborn are approximately 70% to 90% of maternal levels. Piracetam should not be used during pregnancy unless



clearly necessary, when benefit exceeds the risks and the clinical condition of the pregnant mother requires treatment with piracetam.

***Lactation***

Piracetam is excreted in human breast milk. Therefore, piracetam should not be used during breastfeeding or breastfeeding should be discontinued, while receiving treatment with piracetam. A decision must be made whether to discontinue breast-feeding or to discontinue piracetam therapy taking into account the benefit of breast-feeding for the child and the benefit of therapy for the woman.

Expiry date

Do not use later than the date of expiry.

Storage

Store Protected From Light at a Temperature Not Exceeding 25°C.

Presentation

NORMABRAIN is available as 100ml bottle

**MARKETED BY**



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