SUMMARY OF PRODUCT CHARACTERISTICS

1 NAME OF THE MEDICINAL PRODUCT

Lioresal® Liquid

2 QUALITATIVE AND QUANTITATIVE COMPOSITION

The active ingredient is: β-(Aminomethyl)-p-chlorohydrocinnamic acid (= baclofen), a racemic mixture of the R,(-) and S, (+) isomers.
The liquid contains 5mg/5ml baclofen Ph. Eur.

Excipient with know effect :

Sodium 8.1 mg/ 5ml

Sorbital 1925 mg/ 5ml

Methyl parahydroxybenzoate 7 mg/ 5ml

Propyl parahydroxybenzoate 0.7mg/ 5ml

Benzyl alcohol 0.06 mg/ 5ml

For excipients see section 6.1 List of excipients.

3 PHARMACEUTICAL FORM

Liquid

4 CLINICAL PARTICULARS

4.1 Therapeutic indications

Lioresal is indicated for the relief of spasticity of voluntary muscle resulting from such disorders as: multiple sclerosis, other spinal lesions, e.g. tumours of the spinal cord, syringomyelia, motor neurone disease, transverse myelitis, traumatic partial section of the cord.

Lioresal is also indicated in adults and children for the relief of spasticity of voluntary muscle arising from e.g. cerebrovascular accidents, cerebral palsy, meningitis, traumatic head injury.

Patient selection is important when initiating Lioresal therapy; it is likely to be of most benefit in patients whose spasticity constitutes a handicap to activities and/or physiotherapy. Treatment should not be commenced until the spastic state has become stabilised.

Paediatric population

Lioresal is indicated in patients 0 to <18 years for the symptomatic treatment of spasticity of cerebral origin, especially where due to infantile cerebral palsy, as well as following cerebrovascular accidents or in the presence of neoplastic or degenerative brain disease.

Lioresal is also indicated for the symptomatic treatment of muscle spasms occurring in spinal cord diseases of infectious, degenerative, traumatic, neoplastic, or unknown origin such as multiple sclerosis, spastic spinal paralysis, amyotrophic lateral sclerosis, syringomyelia, transverse myelitis, traumatic paraplegia or paraparesis, and compression of the spinal cord.

4.2 Posology and method of administration

Dosage

Lioresal is given orally in either tablet or liquid form. These two formulations are bioequivalent. The liquid may be particularly suitable for children or those adults who are unable to take tablets. Dosage titration can be more precisely managed with the liquid. The lowest dose compatible with an optimal response is recommended.

Before starting treatment with Lioresal it is prudent to realistically assess the overall extent of clinical improvement that the patient may be expected to achieve. Careful titration of dosage is essential (particularly in the elderly) until the patient is stabilised. If too high a dose is initiated or if the dosage is increased too rapidly side effects may occur. This is particularly relevant if the patient is ambulant in order to minimise muscle weakness in the unaffected limbs or where spasticity is necessary for support.

Once the maximum recommended dose has been reached, if the therapeutic effect is not apparent within 6 weeks a decision whether to continue with Lioresal should be taken.

Discontinuation of the treatment should always be gradual by successively reducing the dosage over a period of approximately 1 to 2 weeks, except in overdose-related emergencies, or where serious adverse effects have occurred (see section 4.4).

Adults:

Treatment should be started with a dosage of 15 mg daily, preferably in divided doses. The following gradually increasing dosage regimen is suggested, but should be adjusted to suit individual patient requirements.

5mg three times a day for three days

10mg three times a day for three days

15mg three times a day for three days

20mg three times a day for three days

Satisfactory control of symptoms is usually obtained with doses of up to 60mg daily, but a careful adjustment is often necessary to meet the requirements of each individual patient.

The dose may be increased slowly if required, but a maximum daily dose should not exceed 100mg. Small frequent dosage may prove better in some cases than larger spaced doses.

Also some patients benefit from the use of Lioresal only at night to counteract painful flexor spasm. Similarly a single dose given approximately 1 hour prior to performance of specific tasks such as washing, dressing, shaving, physiotherapy, will often improve mobility.

Special populations

Elderly patients (aged 65 years or above):

Elderly patients may be more susceptible to side effects, particularly in the early stages of introducing Lioresal. Small doses should therefore be used at the start of treatment, the dose being titrated gradually against the response, under careful supervision. There is no evidence that the eventual average maximum dose differs from that in younger patients.

Paediatric population (0 to < 18 years):

Treatment should usually be started with a very low dose (corresponding to approximately 0.3 mg/kg a day), in 2-4 divided doses, preferably in 4 divided doses. The dosage should be cautiously raised at about 1 week intervals, until it becomes sufficient for the child's individual requirements. The usual daily dosage for maintenance therapy ranges between 0.75 and 2mg/kg body weight.

Maximum daily dose

The maximum daily dose should not exceed 2 mg/kg/day.

The maximum daily dose should not exceed 40 mg/day in children below 8 years old and 60 mg/day in children 8 years and older

Lioresal tablets are not suitable for use in children below 33 kg body weight.

Patients with impaired renal function:

In patients with impaired renal function or undergoing chronic haemodialysis, a particularly low dosage of Lioresal should be selected i.e. approx. 5mg daily.

Lioresal should be administered to end stage renal failure patients only if the expected benefit outweighs the potential risk. These patients should be closely monitored for prompt diagnosis of early signs and/or symptoms of toxicity (e.g. somnolence, lethargy) (see section 4.4 and section 4.9).

Patients with hepatic impairment:

No studies have been performed in patients with hepatic impairment receiving Lioresal therapy. The liver does not play a significant role in the metabolism of baclofen after oral administration of Lioresal (see section 5.2). However, Lioresal has the potential of elevating liver enzymes. Lioresal should be prescribed with caution in patients with hepatic impairment.

Patients with spastic states of cerebral origin:

Unwanted effects are more likely to occur in these patients. It is therefore recommended that a cautious dosage schedule be adopted and that patients be kept under appropriate surveillance.

Method of administration

Lioresal should be taken during meals with a little liquid.

4.3 Contraindications

- Hypersensitivity to baclofen or to any of the excipients
- Peptic ulceration

4.4 Special warnings and precautions for use

Psychiatric and nervous system disorders
Psychotic disorders, schizophrenia, depressive or manic disorders, confusional states or Parkinson's disease may be exacerbated by treatment with Lioresal. Patients suffering from these conditions should therefore be treated cautiously and kept under close surveillance.

Suicide and suicide-related events have been reported in patients treated with baclofen. In most cases, the patients had additional risk factors associated with an increased risk of suicide including alcohol use disorder, depression and/or a history of previous suicide attempts. Close supervision of patients with additional risk factors for suicide should accompany drug therapy. Patients (and caregivers of patients) should be alerted about the need to monitor for clinical worsening, suicidal behaviour or thoughts or unusual changes in behaviour and to seek medical advice immediately if these symptoms present.

Cases of misuse, abuse and dependence have been reported with baclofen. Caution should be exercised in patients with a history of substance abuse and the patient should be monitored for symptoms of baclofen misuse, abuse or dependence e.g. dose escalation, drug-seeking behaviour, development of tolerance.

Epilepsy

Lioresal may also exacerbate epileptic manifestations but can be employed provided appropriate supervision and adequate anticonvulsive therapy are maintained.

Encephalopathy
Cases of encephalopathy have been reported in patients receiving baclofen at therapeutic doses, which were reversible after treatment discontinuation. Symptoms included somnolence, depressed level of consciousness, confusion, myoclonus and coma. (see sections 4.8 and 4.9)

If signs of encephalopathy are observed, baclofen should be discontinued.

Others
Lioresal should be used with extreme care in patients already receiving antihypertensive therapy, (see section 4.5).

Lioresal should be used with caution in patients suffering from cerebrovascular accidents or from respiratory or hepatic impairment.

Since unwanted effects are more likely to occur, a cautious dosage schedule should be adopted in elderly and patients with spasticity of cerebral origin (see section 4.2).

Renal impairment
Baclofen should be used with caution in patients with renal impairement and should be administered to end stage renal failure patients only if the expected benefit outweighs the potential risk (See section 4.2 Posology and method of administration). Neurological signs and symptoms of overdose including clinical manifestations of toxic encephalopathy (e.g. confusion, disorientation, somnolence and depressed level of consciousness) have been observed in patients with renal impairment taking oral baclofen at doses of more than 5mg per day and at doses of 5mg per day in patients with end stage renal failure being treated with chronic hemodialysis. Patients with impaired renal function should be closely monitored for prompt diagnosis of early symptoms of toxicity.

Particular caution is required when combining Lioresal to drugs or medicinal products that can significantly affect renal function. Renal function should be closely monitored and Lioresal daily dosage adjusted accordingly to prevent baclofen toxicity.

Cases of baclofen toxicity have been reported in patients with acute renal failure (see section 4.9).

Besides discontinuing treatment, unscheduled haemodialysis might be considered as a treatment alternative in patients with severe baclofen toxicity. Haemodialysis effectively removes baclofen from the body, alleviates clinical symptoms of overdose and shortens the recovery time in these patients.

Urinary disorders
Under treatment with Lioresal neurogenic disturbances affecting emptying of the bladder may show an improvement. In patients with pre-existing sphincter hypertonia, acute retention of urine may occur; the drug should be used with caution in such cases.

Laboratory tests
In rare instances elevated aspartate aminotransferase, blood alkaline phosphatase and blood glucose levels in serum have been recorded. Appropriate laboratory tests

should be performed in patients with liver diseases or diabetes mellitus in order to ensure that no drug induced changes in these underlying diseases have occurred.

Excipients

- Methyl para-hydroxybenzoate (E218) and Propyl para-hydroxybenzoate (E216) may cause allergic reactions (possibly delayed).
- Sorbitol- This medicine contains 1925mg sorbitol in each 5ml dose. Patients with hereditary fructose intolerence (HFI) should not take/be given this medicinal product. Sorbitol may cause gastrointestinal disconfort and mild laxative effect.
- Sodium- This medicine contains less than 1mmol sodium (23mg) per 5ml, that is to say essential 'sodium free'. When the dose is greater than 14 ml it cannot be considered
  'sodium free' and it should be taken into consideration by patients on a controlled sodium diet. At maximum daily dose (120 ml) this medicine contains 194.4 mg of sodium. This is equivalent to 9.72% of the recommended maximum daily dietary intake of sodium for an adult..
- Benzyl alcohol – This medicine contains 0.06mg benzyl alcohol in each 5ml dose. Benzyl alcohol may cause allergic reactions. Benzyl alcohol has been linked with the risk of severe side effects including breathing problems (called "gasping syndrome") in young children and should not be given to newborn babies (up to 4 weeks old), unless recommended by a doctor. High volumes should be used with caution and only if necessary, especially in subjects who are pregnant, breast-feeding or have liver or kidney impairment because of the risk of accumulation and toxicity (metabolic acidosis).

Abrupt withdrawal:

Treatment should always, (unless serious adverse effects occur), be gradually discontinued by successively reducing the dosage over a period of about 1-2 weeks. Anxiety and confusional state, delirium, hallucination, psychotic disorder, mania or paranoia, convulsion (status epilepticus), dyskinesia, tachycardia, hyperthermia, rhabdomyolysis and temporary aggravation of spasticity and hypertonia have been reported with abrupt withdrawal of Lioresal, especially after long term medication.

Drug withdrawal reactions including postnatal convulsions in neonates have been reported after intrauterine exposure to oral Lioresal (see section 4.6).

Treatment should always, (unless serious adverse effects occur), therefore be gradually discontinued by successively reducing the dosage over a period of about 1-2 weeks.

Paediatric patients

There is very limited clinical data on the use of Lioresal in children under the age of one year. Use in this patient population should be based on the physician's consideration of individual benefit and risk of therapy.

Posture and balance

Lioresal should be used with caution when spasticity is needed to sustain upright posture and balance in locomotion (see section 4.2).

4.5 Interaction with other medicinal products and other forms of interaction

Levodopa/dopa decarboxylase (DDC) inhibitor (Carbidopa)
In patients with Parkinson's disease receiving treatment with Lioresal and levodopa (alone or in combination with DDC inhibitor, carbidopa), there have been reports of mental confusion, hallucinations, nausea and agitation. Worsening of the symptoms of Parkinsonism has also been reported. Hence, caution should be exercised during concommitant administration of Lioresal and levodopa/carbidopa.

Drugs causing Central Nervous System (CNS) depression
Increased sedation may occur when Lioresal is taken concomitantly with other drugs causing CNS depression including other muscle relaxants (such as tizanidine), with synthetic opiates or with alcohol (see section 4.7).

The risk of respiratory depression is also increased. In addition, hypotension has been reported with concomitant use of morphine and intrathecal baclofen. Careful monitoring of respiratory and cardiovascular functions is essential especially in patients with cardiopulmonary disease and respiratory muscle weakness.

Antidepressants
During concomitant treatment with tricyclic antidepressants, the effect of Lioresal may be potentiated, resulting in pronounced muscular hypotonia.

Lithium
Concomitant use of oral Lioresal and lithium resulted in aggravated hyperkinetic symptoms. Thus, caution should be exercised when Lioresal is used concomitantly with lithium.

Antihypertensives and other drugs known to lower blood pressure
Since concomitant treatment with Lioresal and drugs that lower blood pressure is likely to increase the fall in blood pressure, the dosage of concomitant medications should be adjusted accordingly.

Agents reducing renal function
Drugs or medicinal products that can significantly affect renal function may reduce baclofen excretion leading to toxic effects (see section 4.4).

4.6 Fertility, pregnancy and lactation

Pregnancy
During pregnancy, especially in the first 3 months, Lioresal should only be employed if its use is of vital necessity. The benefits of the treatment for the mother must be carefully weighed against the possible risks for the child. Baclofen crosses the placental barrier.

Foetal/neonatal adverse reactions
Drug withdrawal reactions including postnatal convulsions in neonates have been reported after intra-uterine exposure to oral Lioresal (see section 4.4).

Breast-feeding

In mothers taking Lioresal at therapeutic doses, the active substance passes into the breast milk, but in quantities so small that no undesirable effects in the infant are to be expected.

4.7 Effects on ability to drive and use machines

Lioresal may be associated with adverse effects such as dizziness, sedation, somnolence and visual impairment (See section 4.8) which may impair the patient's reaction. Patients experiencing these adverse reactions should be advised to refrain from driving or using machines.

4.8 Undesirable effects

Adverse effects occur mainly at the start of treatment (e.g. sedation, somnolence and nausea), if the dosage is raised too rapidly, if large doses are employed, or in elderly patients. They are often transitory and can be attenuated or eliminated by reducing the dosage; they are seldom severe enough to necessitate withdrawal of the medication.

Should nausea persist following a reduction in dosage, it is recommended that Lioresal be ingested with food or a milk beverage.

In patients with a history of psychiatric illness or with cerebrovascular disorders (e.g. stroke) as well as in elderly patients, adverse reactions may assume a more serious form.

Lowering of the convulsion threshold and convulsions may occur, particularly in epileptic patients.

Certain patients have shown increased spasticity as a paradoxical reaction to the medication.

An undesirable degree of muscular hypotonia - making it more difficult for patients to walk or fend for themselves - may occur and can usually be relieved by re-adjusting the dosage (i.e. by reducing the doses given during the day and possibly increasing the evening dose).

Adverse reactions (Table 1) are ranked under heading of frequency, the most frequent first, using the following convention: very common (≥ 1/10); common (≥ 1/100, < 1/10); uncommon (≥ 1/1,000, < 1/100); rare (≥ 1/10,000, < 1/1,000) very rare (< 1/10,000) and not known (cannot be estimated from the available data).

Table 1 Tabulated summary of adverse drug reactions

Immune System disorders	
Not known:	Hypersensitivity
Nervous system disorders	
Very common:	Sedation, somnolence
Common:	Respiratory depression, confusional state, dizziness, hallucination, depression, fatigue, insomnia, euphoric

	mood, muscular weakness, ataxia, tremor, nightmare, myalgia, headache, nystagmus, dry mouth.
Rare:	Paraesthesia, dysarthria, dysgeusia.
Not known:	Sleep Apnoea syndrome*, Encephalopathy
Eye disorders	
Common:	Visual impairment, accommodation disorder
Cardiac disorders	
Common:	Cardiac output decreased
Not known:	Bradycardia
Vascular disorders	
Common:	Hypotension
Gastrointestinal disorders	
Very common:	Nausea
Common:	Gastrointestinal disorder, constipation, diarrhoea, retching, vomiting
Rare:	Abdominal pain
Hepatobiliary disorders	
Rare:	Hepatic function abnormal
Skin and subcutaneous tissue disorders	
Common:	Rash, hyperhidrosis
Not known:	Urticaria, alopecia
Renal and urinary disorders	
Common:	Pollakiuria, enuresis, dysuria
Rare:	Urinary retention
Reproductive system and breast disorders	
Rare:	Erectile dysfunction
Not Known:	Sexual dysfunction
General disorders and administration site conditions	
Very rare:	Hypothermia
Not known:	Drug withdrawal syndrome* (see section 4.4), swelling face and peripheral oedema
Investigations	
Not known:	Blood glucose increased

*Drug withdrawal syndrome including postnatal convulsions in neonates has also been reported after intra-uterine exposure to oral Lioresal.

* Cases of central sleep apnoea syndrome have been observed with baclofen at high doses (≥ 100 mg) in patients who are alcohol dependent.

Reporting of suspected adverse reactions

Reporting suspected adverse reactions after authorization of the medicinal product is important. It allows continued monitoring of the benefit/risk balance of the medicinal product. Healthcare professionals are asked to report any suspected adverse reactions via Yellow Card Scheme (www.mhra.gov.uk/yellowcard).

4.9 Overdose

Symptoms: Prominent features are signs of central nervous depression or encephalopathy: somnolence, depressed level of consciousness, coma, respiratory depression and tinnitus. Also liable to occur are: confusion, hallucination, agitation, convulsion, abnormal electroencephalogram (burst suppression pattern and triphasic waves, generalised slowing on EEG), accommodation disorder, impaired pupillary reflex, generalised muscular hypotonia, myoclonus, hyporeflexia or areflexia, peripheral vasodilatation, hypotension or hypertension, bradycardia, tachycardia or cardiac arrhythmia, hypothermia, nausea, vomiting, diarrhoea, salivary hypersecretion, increased hepatic enzymes and rhabdomyolysis. Patients with renal impairment can develop signs of overdose even on low doses of oral Lioresal (see section 4.2 and section 4.4).

A deterioration in the condition may occur if various substances or drugs acting on the central nervous system (e.g. alcohol, diazepam, tricyclic antidepressants) have been taken at the same time.

Treatment: No specific antidote is known.

Supportive measures and symptomatic treatment should be given for complications such as hypotension, hypertension, convulsions, gastrointestinal disorders and respiratory or cardiovascular depression.

Since the drug is excreted chiefly via the kidneys, generous quantities of fluid should be given, possibly together with a diuretic. Haemodialysis (sometimes unscheduled) may be useful in severe poisoning associated with renal failure (see section 4.4).

5 PHARMACOLOGICAL PROPERTIES

5.1 Pharmacodynamic properties

Pharmacotherapeutic group: Antispastic with spinal site attack, ATC code: M03B X01

Lioresal is an antispastic agent acting at the spinal level. A gamma-aminobutyric acid (GABA) derivative, Lioresal is chemically unrelated to other antispastic agents.

Lioresal depresses monosynaptic and polysynaptic reflex transmission, probably by stimulating the GABAB-receptors, this stimulation in turn inhibiting the release of the excitatory amino acids glutamate and aspartate. Neuromuscular transmission is unaffected by Lioresal.

The major benefits of Lioresal stem from its ability to reduce painful flexor spasms and spontaneous clonus thereby facilitating the mobility of the patient, increasing his independence and helping rehabilitation.

Lioresal also exerts an antinociceptive effect. General well being is often improved and sedation is less often a problem than with centrally acting drugs.

Baclofen stimulates gastric acid secretion.

5.2 Pharmacokinetic properties

Absorption: Lioresal (baclofen) is rapidly and completely absorbed from the gastro-intestinal tract. No significant difference between the liquid and tablet formulations is observed in respect of Tmax, Cmax and bioavailability. Following oral administration of single doses (10-30mg) peak plasma concentrations are recorded after 0.5 to 1.5 hours and areas under the serum concentration curves are proportional to the dose.

Distribution: The volume of distribution of baclofen is 0.7 l/kg. The protein binding rate is approximately 30% and is constant in the concentration range of 10 nanogram/mL to 300 microgram/mL. In cerebrospinal fluid active substance concentrations are approximately 8.5 times lower than in the plasma.

Biotransformation: Baclofen is metabolised to only a minor extent. Deamination yields the main metabolite, β-(p-chlorophenyl)-4-hydroxybutyric acid, which is pharmacologically inactive.

Elimination/excretion: The plasma elimination half-life of baclofen averages 3 to 4 hours.

Baclofen is eliminated largely in unchanged form. Within 72 hours, approximately 75% of the dose is excreted via the kidneys with about 5% of this amount as metabolites.

Special populations

Elderly patients (aged 65 years or above)

The pharmacokinetics of baclofen in elderly patients are virtually the same as in patients below 65 years of age. Following a single oral dose, elderly patients have slower elimination but a similar systemic exposure of baclofen compared to adults below 65 years of age. Extrapolation of these results to multi-dose treatment suggests no significant pharmacokinetic difference between patients below 65 years of age and elderly patients.

Paediatric patients

Following oral administration of 2.5mg Lioresal tablet in children (aged 2 to12 years), Cmax of 62.8±28.7 nanogram/mL, and Tmax in the range of 0.95-2 h have been reported. Mean plasma clearance (Cl) of 315.9mL/h/kg; volume of distribution (Vd) of 2.58 L/kg; and half-life ($T_{1/2}$) of 5.10 h have been reported.

Hepatic impairment

No pharmacokinetic data are available in patients with hepatic impairment after administration of Lioresal. However, as the liver does not play a significant role in the disposition of baclofen, it is unlikely that baclofen pharmacokinetics would be altered to a clinically significant level in patients with hepatic impairment.

Renal impairment
No controlled clinical pharmacokinetic study is available in patients with renal impairment after administration of Lioresal. Baclofen is predominantly eliminated unchanged in urine. Sparse plasma concentration data collected only in female patients under chronic hemodialysis or compensated renal failure indicate significantly decreased clearance and increased half-life of baclofen in these patients. Dosage adjustment of baclofen based on its systemic levels should be considered in renal impairment patients, and prompt hemodialysis is an effective means of reversing excess baclofen in systemic circulation.

5.3 Preclinical safety data

Baclofen increases the incidence of omphaloceles (ventral hernias) in the foetuses of rats given approximately 13 times the maximum oral dose (on a mg/kg basis) recommended for human use. This was not seen in mice or rabbits.

An apparently dose related increase in the incidence of ovarian cysts, and a less marked increase in enlarged and/or haemorrhagic adrenals have been observed in female rats treated for 2 years. The clinical relevance of these findings is not known.

Experimental evidence to date suggests that baclofen does not possess either carcinogenic or mutagenic properties.

6 PHARMACEUTICAL PARTICULARS

6.1 List of excipients

Methyl hydroxybenzoate; propyl hydroxybenzoate; raspberry flavour (contains benzyl alcohol); carmellose sodium, sorbitol; purified water.

6.2 Incompatibilities

None known.

6.3 Shelf life

3 years

6.4 Special precautions for storage

Protect from light: Store below 25°C. Do not refrigerate.

Dilution: Lioresal liquid may be diluted with Purified Water BP and stored at room temperature for up to 14 days.

6.5 Nature and contents of container

Liquid 5mg/5ml: clear, very slightly yellow solution with a raspberry flavour.

Bottles of 300ml with child proof closures.

6.6 Special precautions for disposal

There is no specific instruction for use/handling.

7 MARKETING AUTHORISATION HOLDER

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