SUMMARY OF PRODUCT CHARACTERISTICS

1. NAME OF THE MEDICINAL PRODUCT

Terbutaline <TRADE NAME> <STRENGTH> Solution for injection or infusion

<REGARDING THE APPROVAL>

1. QUALITATIVE AND QUANTITATIVE COMPOSITION

Each 1 ml solution for injection contains <STRENGTH> of terbutaline sulfate.

For the full list of excipients, see section 6.1.

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1. PHARMACEUTICAL FORM

Solution for injection or infusion. <REGARDING THE APPROVAL>

1. CLINICAL PARTICULARS
   1. Therapeutic indications

**Bronchodilation**

Terbutaline is a selective beta2-adrenergic agonist recommended for the relief of bronchospasm in bronchial asthma and other bronchopulmonary disorders in which bronchospasm is a complicating factor.

**For the short-term management of uncomplicated premature labour**

To arrest labour between 22 and 37 weeks of gestation in patients with no medical or obstetric contraindication to tocolytic therapy.

* 1. Posology and method of administration

**Posology**

The dosage should be individualised.

**For bronchodilation**

When a rapid therapeutic response is required, Terbutaline can be administered by any of the three standard parenteral routes: subcutaneous, intramuscular, or i.v. bolus. The preferred routes will usually be subcutaneous or intramuscular. When given as an i.v. bolus the injection must be made slowly noting patient response.

**Adults**: 0.25 - 0.5 mg up to four times a day.

**Paediatric population**

Children 2 - 15 years: 0.01 mg/kg body weight to a maximum of 0.3 mg total.

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| --- | --- | --- | --- |
| **Age** | **Average weight** | | **mg** |
| **kg** | **(lb)** | **terbutaline** |
| <3 | 10 | (22) | 0.1 |
| 3 | 15 | (33) | 0.15 |
| 6 | 20 | (44) | 0.2 |
| 8 | 25 | (55) | 0.25 |
| 10+ | 30+ | (66+) | 0.3 |

By infusion: 1.5 - 2.5 mg in 500 ml 5% dextrose, saline or dextrose/saline given by continuous intravenous infusion at a rate of 10 - 20 drops (0.5 - 1 ml) per minute for 8 to 10 hours. A corresponding reduction in dosage should be made for children.

**Elderly**: Dosage as for adults.

**In the short-term management of uncomplicated premature labour**

Treatment with Terbutaline should only be initiated by obstetricians/physicians experienced in the use of tocolytic agents. It should be carried out in facilities adequately equipped to perform continuous monitoring of maternal and foetus health status.

Duration of treatment should not exceed 48 hours as data show that the main effect of tocolytic therapy is a delay in delivery of up to 48 hours; no statistically significant effect on perinatal mortality or morbidity has been observed in randomised, controlled trials. This short term delay may be used to implement other measures known to improve perinatal health.

Terbutaline should be administered as early as possible after the diagnosis of premature labour, and after evaluation of the patient to eliminate any contraindications to the use of terbutaline (see section 4.3). This should include an adequate assessment of the patient's cardiovascular status with supervision of cardiorespiratory function and ECG monitoring throughout treatment (see section 4.4).

Initially, 5 mcg/min should be infused during the first 20 minutes increasing

by 2.5 mcg/min at 20 minute intervals until the contractions stop. More than 10 mcg/min should seldom be given, 20 mcg/min should not be exceeded.

The infusion should be stopped if labour progresses despite treatment at the maximum dose.

If successful, the infusion should continue for 1 hour at the chosen rate and then be decreased by 2.5 mcg/min every 20 minutes to the lowest dose that produces suppression of contractions.

Special cautions for infusion: The dose must be individually titrated with reference to suppression of contractions, increase in pulse rate and changes in blood pressure, which are limiting factors. These parameters should be carefully monitored during treatment. A maximum maternal heart rate of 120 beats per min should not be exceeded.

Careful control of the level of hydration is essential to avoid the risk of maternal pulmonary oedema (see section 4.4). The volume of fluid in which the drug is administered should thus be kept to a minimum. A controlled infusion device should be used, preferably a syringe pump.

**Dilution**:

<REGARDING THE APPROVAL>

**Method of administration**

Parenteral - subcutaneous, intramuscular, intravenous.

* 1. Contraindications

Hypersensitivity to the active substance or to any of the excipients listed in section 6.1.

**In the treatment of premature labour Terbutaline is contraindicated in the following conditions**:

• A gestational age of < 22 weeks.

• As a tocolytic agent in patients with pre-existing ischaemic heart disease or those patients with significant risk factors for ischaemic heart disease.

• Threatened abortion during the 1st and 2nd trimester.

• Any condition of the mother or foetus in which prolongation of the pregnancy is hazardous, e.g. severe toxaemia, intrauterine infection, vaginal bleeding resulting from placenta praevia, eclampsia or severe preeclampsia, placental abruption, or cord compression.

• Intrauterine foetal death, known lethal congenital or lethal chromosomal malformation.

• Terbutaline is also contraindicated in any pre-existing medical conditions with which a beta-mimetic would have an untoward effect e.g. pulmonary hypertension and cardiac disorders such as hypertrophic obstructive cardiomyopathy or any type of obstruction of the left ventricular outflow tract e.g. aortic stenosis.

* 1. Special warnings and precautions for use

As for all beta2-agonists caution should be observed in patients with thyrotoxicosis.

Cardiovascular effects may be seen with sympathomimetic drugs, including Terbutaline. There is some evidence from post-marketing data and published literature of myocardial ischaemia associated with beta agonists.

Due to the positive inotropic effect of the beta2-agonists, these drugs should not be used in patients with hypertrophic cardiomyopathy.

**Bronchospasm**

Patients with underlying severe heart disease (e.g. ischaemic heart disease, arrhythmia or severe heart failure) who are receiving Terbutaline should be warned to seek medical advice if they experience chest pain or other symptoms of worsening heart disease.

Attention should be paid to assessment of symptoms such as dyspnoea and chest pain, as they may be of either respiratory or cardiac origin.

Due to the hyperglycaemic effects of beta2-agonists, additional blood glucose controls are recommended initially in diabetic patients. Potentially serious hypokalaemia may result from beta2-agonist therapy. Particular caution is recommended in acute severe asthma as the associated risk may be augmented by hypoxia. The hypokalaemic effect may be potentiated by concomitant treatments (see section 4.5). It is recommended that serum potassium levels are monitored in such situations.

If a previously effective dosage regimen no longer gives the same symptomatic relief, the patient should urgently seek further medical advice. Consideration should be given to the requirements for additional therapy (including increased dosages of anti-inflammatory medication). Severe exacerbations of asthma should be treated as an emergency in the usual manner.

Lactic acidosis has been reported in association with high therapeutic doses of parenteral and nebulised short-acting beta-agonist therapy, mainly in patients being treated for an acute asthma exacerbation (see section 4.8). In patients not adequately responding to acute Terbutaline therapy, consideration should be given to the presence of lactic acidosis as a possible contributing factor to ongoing respiratory symptoms.

**Tocolysis**

Any decision to initiate therapy with Terbutaline should be undertaken after careful consideration of the risks and benefits of treatment.

Treatment should only be carried out in facilities adequately equipped to perform continuous monitoring of maternal and foetal health status. Tocolysis with beta-agonists is not recommended when membranes have ruptured or the cervix dilation is beyond 4 cm.

Terbutaline should be used with caution in tocolysis and supervision of cardiorespiratory function and ECG monitoring, should be performed throughout treatment.

The following monitoring measures must be constantly applied to the mother and, when feasible/appropriate, to the foetus:

• Blood pressure and heart rate.

• ECG.

• Electrolyte and fluid balance–to monitor for pulmonary oedema.

• Glucose and lactate levels–with particular regard to diabetic patients-during treatment of preterm labour, when high doses of Terbutaline are used, diabetic mothers may develop hyperglycaemia and lactacidosis. In these patients glucose and acid-base balance should be carefully monitored.

• Potassium levels– beta-agonists are associated with a decrease in serum potassium which increases the risk of arrhythmias (see section 4.5).

Treatment should be discontinued if signs of myocardial ischaemia (such as chest pain or ECG changes) develop.

Terbutaline should not be used as a tocolytic agent in patients with significant risk factors for, or a suspicion of any kind of pre-existing heart disease (e.g. tachyarrhythmias, heart failure, or valvular heart disease; see section 4.3). In premature labour in a patient with known or suspected cardiac disease, a physician experienced in cardiology should assess the suitability of treatment before intravenous infusion with Terbutaline.

An increased tendency to bleeding has been described in connection with cesarean section (give propranolol 1-2 mg i.v.) in patients treated with Terbutaline solution for injection for preterm labour.

**Pulmonary oedema**

As maternal pulmonary oedema and myocardial ischaemia have been reported during or following treatment of premature labour with beta-agonists, careful attention should be given to fluid balance and cardio-respiratory function. Patients with predisposing factors including multiple pregnancies, fluid overload, maternal infection and pre-eclampsia may have an increased risk of developing pulmonary oedema. Administration with a syringe pump as opposed to i.v. infusion will limit risk of fluid overload. If signs of pulmonary oedema or myocardial ischaemia develop, discontinuation of treatment should be considered (see section 4.2 and 4.8).

**Blood pressure and heart rate**

Increases in maternal heart rate of the order of 20 to 50 beats per minute usually accompany infusion of beta-agonists. The maternal pulse rate should be monitored and the need to control such increases by dose reduction or drug withdrawal should be evaluated on a case by case basis. Generally maternal pulse rate should not be allowed to exceed a steady rate of 120 beats per minute.

Maternal blood pressure may fall slightly during the infusion; the effect being greater on diastolic than on systolic pressure. Falls in diastolic pressure are usually within the range of 10 to 20 mmHg. The effect of infusion on foetal heart rate is less marked, but increases of up to 20 beats per minute may occur.

In order to minimise the risk of hypotension associated with tocolytic therapy, special care should be taken to avoid caval compression by keeping the patient in the left or right lateral positions throughout the infusion.

**Diabetes**

Administration of beta agonists is associated with a rise of blood glucose. Therefore blood glucose and lactate levels should be monitored in mothers

with diabetes and diabetic treatment adjusted accordingly to meet the needs of the diabetic mother during tocolysis (see section 4.5).

**Hyperthyroidism**

Terbutaline should only be administered cautiously to patients suffering from thyrotoxicosis after careful evaluation of the benefits and risks of treatment.

**Excipient information**

<REGARDING THE APPROVAL>

* 1. Interaction with other medicinal products and other forms of interaction

Beta-blocking agents (including eye drops), especially the non-selective ones such as propranolol, may partially or totally inhibit the effect of beta-stimulants. Therefore, Terbutaline preparations and non-selective beta-blockers should not normally be administered concurrently. Terbutaline should be used with caution in patients receiving other sympathomimetics.

**Halogenated anaesthetics**

Owing to the additional antihypertensive effect, there is increased uterine inertia with risk of haemorrhage; in addition, serious ventricular rhythm disorders due to increased cardiac reactivity, have been reported on interaction with halogenated anaesthetics. Treatment should be discontinued, whenever possible, at least 6 hours before any scheduled anaesthesia with halogenated anaesthetics.

Halothane anaesthesia should be avoided during beta2-agonists treatment, since it increases the risk of cardiac arrhythmias. Other halogenated anaesthetics should be used cautiously together with beta2-agonists.

**Corticosteroids**

Systemic corticosteroids are frequently given during premature labour to enhance foetal lung development. There have been reports of pulmonary oedema in women concomitantly administered with beta-agonists and corticosteroids. Corticosteroids are known to increase blood glucose and can deplete serum potassium; therefore, concomitant administration should be undertaken with caution with continuous patient monitoring owing to the increased risk of hyperglycaemia and hypokalaemia (see section 4.4).

**Anti-diabetics**

The administration of beta-agonists is associated with a rise of blood glucose, which can be interpreted as an attenuation of anti-diabetic therapy; therefore individual anti-diabetic therapy may need to be adjusted (see section 4.4).

**Potassium depleting agents**

Owing to the hypokalaemic effect of beta-agonists, concurrent administration of serum potassium depleting agents known to exacerbate the risk of hypokalaemia, such as diuretics, digoxin, methyl xanthines and corticosteroids, should be administered cautiously after careful evaluation of the benefits and risks with special regard to the increased risk of cardiac arrhythmias arising as a result of hypokalaemia (see section 4.4).

* 1. Fertility, pregnancy and lactation

**Bronchospasm**

**Pregnancy**

Although no teratogenic effects have been observed in animals or in patients, Terbutaline should only be administered with caution during the first trimester of pregnancy.

**Breast-feeding**

Terbutaline is secreted into breast milk, but any effects on the infant are unlikely at therapeutic doses.

Transient hypoglycaemia has been reported in newborn preterm infants after maternal beta2-agonist treatment.

**Premature Labour**

Terbutaline solution for injection is contraindicated for the treatment of premature labour before the gestational age of week 22 (see section 4.3).

* 1. Effects on ability to drive and use machines

Terbutaline has no or negligible influence on the ability to drive and use machines.

* 1. Undesirable effects

The intensity of the adverse reactions depends on dosage and route of administration. An initial dose titration will often reduce the adverse reactions. Most of the adverse reactions are characteristic of sympathomimetic amines. The majority of these effects have reversed spontaneously within the first 1-2 weeks of treatment. The frequency of side effects is low at the recommended doses. Adverse events are listed below by system organ class and frequency. Frequencies are defined as: very common (>1/10), common (>1/100 to <1/10), uncommon (>1/1,000 to <1/100), rare (>1/10,000 to <1/1,000), very rare (<1/10,000) and not known (cannot be estimated from the available data).

**Bronchial asthma. Chronic bronchitis, emphysema and other lung diseases where bronchospasm is a complicating factor.**

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| --- | --- | --- |
| **System Organ Class (SOC)** | **Frequency Classification** | **Adverse Drug Reaction Preferred Term** |
| Immune System Disorders | Not Known ^ | Hypersensitivity reactions including angioedema, bronchospasm, hypotension and collapse |
| Metabolism and Nutritional Disorders | Common | Hypokalaemia (see section 4.4) |
| Rare | Lactic acidosis |
| Psychiatric Disorders | Not Known ^ | Sleep disorder and Behavioural disturbances, such as agitation and restlessness |
| Nervous System Disorders | Very Common | Tremor  Headache |
| Cardiac Disorders | Common | Tachycardia  Palpitations |
| Not Known ^ | Arrhythmias, e.g. atrial fibrillation, supraventricular tachycardia and extrasystoles  Myocardial ischaemia (see section 4.4) |
| Vascular Disorders | Not Known ^ | Peripheral vasodilation |
| Respiratory, Thoracic and Mediastinal Disorders | Not Known ^ | Paradoxical bronchospasm \* |
| Gastrointestinal Disorders | Not Known ^ | Nausea  Mouth and throat irritation |
| Skin and Subcutaneous Tissue Disorders | Not Known ^ | Urticaria  Rash |
| Musculoskeletal and Connective Tissue Disorders # | Common | Muscle spasms |

^ Reported spontaneously in post-marketing data and therefore frequency regarded as unknown

\* In rare cases, through unspecified mechanisms, paradoxical bronchospasm may occur, with wheezing immediately after inhalation. This should be immediately treated with a rapid-onset bronchodilator. Terbutaline therapy should be discontinued and after assessment, an alternative therapy initiated.

# A few patients feel tense; this is also due to the effects on skeletal muscle and not to direct CNS stimulation.

**Preterm labour**

The most common undesirable effects of Terbutaline are correlated with the betamimetic pharmacological activity and may be limited or avoided by a close monitoring of haemodynamic parameters, such as blood pressure and heart rate, and an appropriate adjustment of the dose. They normally recede upon therapy discontinuation.

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| --- | --- | --- |
| **System Organ Class (SOC)** | **Frequency Classification** | **Adverse Drug Reaction Preferred Term** |
| Blood and Lymphatic System Disorders | Not Known ^ | An increased tendency to bleeding in connection with caesarean section |
| Immune System Disorders | Not Known ^ | Hypersensitivity reactions including angioedema, bronchospasm, hypotension and collapse |
| Metabolism and Nutritional Disorders | Common | Hypokalaemia (see section 4.4)° |
| Rare | Hyperglycaemia° |
| Rare | Lactic acidosis |
| Psychiatric Disorders | Not Known ^ | Sleep disorder and Behavioural disturbances, such as agitation and restlessness  Hyperactivity |
| Nervous System Disorders | Very Common | Tremor  Headache |
| Cardiac Disorders | Very Common | Tachycardia° |
| Common | Palpitations°  Decrease in diastolic pressure° |
| Rare | Cardiac arrhythmias, e.g. atrial fibrillation, supraventricular tachycardia and extrasystoles°  Myocardial ischaemia (see section 4.4)° |
| Vascular Disorder | Common | Hypotension (see section 4.4)° |
| Rare | Peripheral vasodilatation° |
| Respiratory, Thoracic and Mediastinal Disorders | Uncommon | Pulmonary oedema° |
| Not Known ^ | Paradoxical bronchospasm \* |
| Gastrointestinal Disorders | Very Common | Nausea |
| Not Known ^ | Mouth and throat irritation |
| Skin and Subcutaneous Tissue Disorders | Not Known ^ | Urticaria  Rash |
| Musculoskeletal and Connective Tissue Disorders # | Not Known ^ | Muscle spasms |

^ Reported spontaneously in post-marketing data and therefore frequency regarded as unknown

° These reactions have been reported in association with the use of short acting beta-agonists in obstetric indications and are considered class effects (see section 4.4).

\* In rare cases, through unspecified mechanisms, paradoxical bronchospasm may occur, with wheezing immediately after inhalation. This should be immediately treated with a rapid-onset bronchodilator. Terbutaline therapy should be discontinued and after assessment, an alternative therapy initiated.

# A few patients feel tense; this is also due to the effects on skeletal muscle and not to direct CNS stimulation.

Reporting of suspected adverse reactions

Reporting suspected adverse reactions after authorisation of the medicinal product is important. It allows continued monitoring of the benefit/risk balance of the medicinal product. Healthcare professionals are asked to report any suspected adverse reactions via Health Product Vigilance Center; HPVC.

* 1. Overdose

**Symptoms**

Headache, anxiety, tremor, nausea, tonic cramps, palpitations, tachycardia and arrhythmia. A fall in blood pressure sometimes occurs. Laboratory findings: hypokalaemia, hyperglycaemia and lactic acidosis sometimes occur (see section 4.4).

**Management**

Mild and moderate cases: Reduce the dose.

Severe cases: Determination of acid-base balance, blood sugar and electrolytes, particularly serum potassium levels. Monitoring of heart rate and rhythm and blood pressure. Metabolic changes should be corrected. A cardioselective beta-blocker (e.g. metoprolol) is recommended for the treatment of arrhythmias causing haemodynamic deterioration. The beta-blocker should be used with care because of the possibility of inducing bronchoconstriction: use with caution in patients with a history of bronchospasm. If the beta2-mediated reduction in peripheral vascular resistance significantly contributes to the fall in blood pressure, a volume expander should be given.

In preterm labour:

Pulmonary oedema: discontinue administration of Terbutaline. A normal dose of loop diuretic (e.g. frusemide) should be given intravenously.

Increased bleeding in connection with Cesarean section: propranolol, 1-2 mg intravenously.

1. PHARMACOLOGICAL PROPERTIES
   1. Pharmacodynamic properties

Pharmaco-therapeutic group: selective β2-agonist, terbutaline,

ATC code: R03C C03.

Terbutaline is a selective β2-adrenergic stimulant, having the following pharmacological effects:

i) In the lung: bronchodilation; increase in mucociliary clearance; suppression of oedema and anti-allergic effects.

ii) In skeletal muscle: stimulates Na+/K+ transport and also causes depression of subtetanic contractions in slow-contracting muscle.

iii) In uterine muscle: inhibition of uterine contractions.

iv) In the CNS: low penetration into the blood-brain barrier at therapeutic doses, due to the highly hydrophilic nature of the molecule.

v) In the CVS: administration of terbutaline results in cardiovascular effects mediated through β2-receptors in the peripheral arteries and in the heart e.g. in healthy subjects, 0.25 - 0.5 mg injected s.c. is associated with an increase in cardiac output (up to 85% over controls) due to an increase in heart rate and a larger stroke volume. The increase in heart rate is probably due to a combination of a reflex tachycardia, via a fall in peripheral resistance and a direct positive chronotropic effect of the drug.

* 1. Pharmacokinetic properties

Basic parameters have been evaluated in man after i.v. and oral administration of therapeutic doses, e.g.

i.v. single dose

Volume of distribution (VSS) - 114 L

Total body clearance (CL) - 213 ml/min

Mean residence time (MRT) - 9.0 h

Renal clearance (CLR) - 149 ml/min (males)

Oral dose

Renal clearance (CLR) - 1.925 ml/min (males)

Renal clearance (CLR) - 2.32 ml/min (females)

The plasma concentration/time curve after i.v. administration is characterised by a fast distribution phase, an intermediate elimination phase and a late elimination phase.

Terminal half-life (t½) has been determined after single and multiple dosing (mean values varied between 16 - 20 h).

**Bioavailability**

Food reduces bioavailability following oral dosing (10% on average); fasting values of 14 - 15% have been obtained.

**Metabolism**

The main metabolite after oral dosing is the sulfate conjugate and also some glucuronide conjugate can be found in the urine.

* 1. Preclinical safety data

The major toxic effect of terbutaline, observed in toxicological studies in rats and dogs at exposures in excess of maximum human exposure, is focal myocardial necrosis. This type of cardiotoxicity is a well-known pharmacological manifestation seen after the administration of high doses of 2-agonists.

In rats an increase in the incidence of benign uterine leiomyomas has been observed. This effect is looked upon as a class-effect observed in rodents after long exposure to high doses of 2-agonists.

1. PHARMACEUTICAL PARTICULARS
   1. List of excipients

<REGARDING THE APPROVAL>

* 1. Incompatibilities

Terbutaline solution for injection should not be mixed with alkaline solutions, i.e. solutions with a pH higher than 7.0.

* 1. Shelf life

<REGARDING THE APPROVAL>

* 1. Special precautions for storage

<REGARDING THE APPROVAL>

* 1. Nature and contents of container

<REGARDING THE APPROVAL>

* 1. Special precautions for disposal

Bronchodilation: the recommended diluent is 5% dextrose, saline or dextrose/saline.

In the management of premature labour, the recommended infusion fluid is 5% dextrose. Saline should be avoided due to the risk of pulmonary oedema. If saline is used, the patient should be carefully monitored.

<REGARDING THE APPROVAL>

1. MARKETING AUTHORISATION HOLDER

<REGARDING THE APPROVAL>

1. MARKETING AUTHORISATION NUMBER(S)

<REGARDING THE APPROVAL>

1. DATE OF FIRST AUTHORISATION/RENEWAL OF THE AUTHORISATION

<REGARDING THE APPROVAL>

1. DATE OF REVISION OF THE TEXT1

<REGARDING THE APPROVAL>