
DBL™ DESFERRIOXAMINE MESYLATE FOR INJECTION BP

Name of medicine

Desferrioxamine Mesylate

Presentation

DBL™ Desferrioxamine Mesylate for Injection BP is a sterile, lyophilised powder for reconstitution containing 500 mg or 2 gram of Desferrioxamine Mesylate BP. Desferrioxamine Mesylate BP is a white to cream powder. When reconstituted with Water for Injections BP a clear solution with a pH of 3.5 to 5.5 is produced.

Uses

Actions

Desferrioxamine forms complexes predominantly with ferric iron and with trivalent aluminium ions: the complex formation constants are 10^{31} and 10^{25} , respectively. The affinity of desferrioxamine for divalent ions such as Fe^{2+} , Cu^{2+} , Zn^{2+} , Ca^{2+} is substantially lower (complex formation constants 10^{14} or below). Chelation occurs at a 1:1 molar basis, so that 1 g desferrioxamine can theoretically bind 85 mg ferric iron or 41 mg Al^{3+} .

Owing to its chelating properties, desferrioxamine is capable of taking up free iron, either in plasma or in cells thereby forming the complex ferrioxamine. Urinary iron excretion of ferrioxamine is predominantly a reflection of iron derived from plasma turnover whereas faecal iron reflects mainly intrahepatic iron chelation. Iron may be chelated from ferritin and haemosiderin but is relatively slow at clinically relevant concentrations of desferrioxamine. Desferrioxamine, however, does not remove iron from transferrin or from haemoglobin or from other haemin-containing substances.

Desferrioxamine can also mobilise and chelate aluminium, forming an aluminioxamine complex.

Since both complexes, ferrioxamine and aluminioxamine, are completely excreted, desferrioxamine promotes the excretion of iron and aluminium in the urine and faeces and thus reduces pathological iron or aluminium deposits in the organs.

Pharmacokinetics

Absorption

Desferrioxamine is rapidly absorbed after intramuscular bolus injection or slow subcutaneous infusion, but only poorly absorbed from the gastrointestinal tract in the presence of intact mucosa. The absolute bioavailability is less than 2% after oral administration of 1 g desferrioxamine.

During peritoneal dialysis desferrioxamine is absorbed if administered in the dialysis fluid.

Distribution

In healthy volunteers peak plasma concentrations of 15.5 micromol/L (8.7 mcg/mL) were measured 30 minutes after an intramuscular injection of 10 mg/kg desferrioxamine. One hour after injection the peak concentration of ferrioxamine was 3.7 micromol/L (2.3 mcg/mL). After intravenous infusion of 2 g (about 29 mg/kg) of desferrioxamine to healthy volunteers over 2 hours mean steady state concentrations of desferrioxamine of 30.5 micromol/L were reached; distribution of desferrioxamine is very rapid with a mean distribution half-life of 0.4 hours. Less than 10 % of desferrioxamine is bound to serum proteins *in vitro*.

Biotransformation

Four metabolites of desferrioxamine were isolated and identified from urine of patients with iron overload. The following biotransformation reactions were found to occur with desferrioxamine: transamination and oxidation yielding an acid metabolite, beta-oxidation also yielding an acid metabolite, decarboxylation and N-hydroxylation yielding neutral metabolites.

Elimination

Both desferrioxamine and ferrioxamine have a biphasic elimination after intramuscular injection in healthy volunteers; for desferrioxamine the apparent distribution half-life is 1 hour, and for ferrioxamine 2.4 hours. The apparent terminal half-life is 6 hours for both. Within six hours of injection, 22 % of the dose appears in the urine as desferrioxamine and 1 % as ferrioxamine.

Characteristics in patients

In **patients with haemochromatosis** peak plasma levels of 7.0 micromol/L (3.9 mcg/mL) were measured for desferrioxamine, and 15.7 micromol/L (9.6 mcg/mL) for ferrioxamine, 1 hour after an intramuscular injection of 10 mg/kg desferrioxamine. These patients eliminated desferrioxamine and ferrioxamine with half-lives of 5.6 and 4.6 hours, respectively. Six hours after the injection 17 % of the dose was excreted in the urine as desferrioxamine and 12 % as ferrioxamine.

In **patients with thalassaemia** continuous intravenous infusion of 50 mg/kg/24 h of desferrioxamine resulted in plasma steady state levels of desferrioxamine of 7.4 micromol/L (4.1 mcg/mL). Elimination of desferrioxamine from plasma was biphasic with a mean distribution half-life of 0.28 hours and an apparent terminal half-life of 3.0 hours. The total plasma clearance was 0.5 L/h/kg and the volume of distribution at steady state was estimated at 1.35 L/kg. Exposure to the main iron binding metabolite was around 54% of that of desferrioxamine in terms of AUC. The apparent monoexponential elimination half-life of the metabolite was 1.3 hours.

In **patients dialysed for renal failure** who received 40 mg/kg desferrioxamine infused i.v. within 1 hour, the plasma concentration at the end of the infusion was 152 micromol/L (85.2 mcg/mL) when the infusion was given between dialysis sessions. Plasma concentrations of desferrioxamine were between 13 % and 27 % lower when the infusion was administered during dialysis. Concentrations of ferrioxamine were in all cases approx. 7.0 micromol/L (4.3 mcg/mL); and for aluminoxamine 2-3 micromol/L (1.2-1.8 mcg/mL). After the infusion was discontinued, the plasma concentration of desferrioxamine decreased rapidly with a half-life of 20 minutes. A smaller fraction of the dose was eliminated with a longer half-life of 14 hours. The plasma concentrations of aluminoxamine continued to increase for up to 48 hours after the infusion and reached values of approx. 7 micromol/L (4 mcg/mL). Following dialysis the plasma concentration of aluminoxamine dropped to 2.2 micromol/L (1.3 mcg/mL).

Indications

Monotherapy iron chelation treatment for chronic iron overload, e.g.

- transfusional haemosiderosis, as seen in thalassaemia major, sideroblastic anaemia, auto-immune haemolytic anaemia, and other chronic anaemias.
- idiopathic (primary) haemochromatosis in patients in whom concomitant disorders (e.g. severe anaemia, cardiac disease, hypoproteinaemia) preclude phlebotomy
- iron overload associated with porphyria cutanea tarda in patients unable to tolerate phlebotomy.
- Treatment for acute iron poisoning.

Treatment for chronic aluminium overload in patients with end-stage renal failure (under maintenance dialysis) with

- aluminium-related bone disease,
- dialysis encephalopathy or
- aluminium-related anaemia.

Dosage and administration

Treatment for chronic iron overload

The main aim of chelation therapy in iron overload in young patients is to achieve an iron balance and to prevent haemosiderosis, while in the older patient a negative iron balance is desirable in order to reduce slowly the increased iron stores and to prevent the toxic effects of iron.

Children and Adults

It is recommended that therapy with Desferrioxamine Mesylate for Injection be started after the first 10-20 blood transfusions or when the serum ferritin level has reached 1000 ng/mL.

Growth retardation may result from iron overload or excessive Desferrioxamine Mesylate for Injection doses. If chelation is begun before 3 years of age growth must be monitored carefully and the mean daily dose should not exceed 40 mg/kg.

The dosage and the mode of administration may be individually determined and adapted during the course of therapy according to the severity of the patient's iron burden. The lowest effective dosage should be used. To assess the response to chelation therapy, 24-hour urinary iron excretion may initially be monitored daily and the response to increasing doses of Desferrioxamine Mesylate for Injection established. Once the appropriate dosage has been established, urinary iron excretion rates may be assessed at intervals of a few weeks. Alternatively the mean daily dose may be adjusted according to the ferritin value to keep the therapeutic index less than 0.025 (i.e. mean daily dose (mg/kg) of Desferrioxamine Mesylate for Injection divided by the serum ferritin level (mcg/L) below 0.025. The average daily dose of Desferrioxamine Mesylate for Injection is usually between 20 and 60 mg/kg.

In general patients with a serum ferritin level of less than 2000 ng/mL require about 25 mg/kg/day. Patients with a serum ferritin level between 2000 and 3000 ng/mL require about 35 mg/kg/day. Patients with higher serum ferritin may require up to 55 mg/kg/day. It is inadvisable regularly to exceed an average daily dose of 50 mg/kg/day except when very intensive chelation is needed in patients who have completed growth. If ferritin values fall below 1000 ng/mL, the risk of Desferrioxamine Mesylate for Injection toxicity increases; it is important to monitor these patients particularly carefully and perhaps to consider lowering the total weekly dose. The doses given are the average daily dose. Since most patients take the drug on less than 7 days a week, the actual dose per infusion usually differs from the average daily dose; e.g. if an average daily dose of 40 mg/kg/day is required and the patient wears the pump 5 nights a week, each infusion should contain 56 mg/kg.

Regular chelation with Desferrioxamine Mesylate for Injection has been shown to improve life expectancy in patients with thalassaemia.

Slow **subcutaneous infusion** by means of a portable, light-weight infusion pump over a period of 8-12 hours is regarded as effective and especially convenient for ambulant patients, but may also be given over a 24-hour period. Desferrioxamine Mesylate for Injection should be used with the pump 5 to 7 times a week depending on the severity of iron overload.

Intravenous infusion during blood transfusion

The availability of an intravenous line during blood transfusions makes it possible to administer an intravenous infusion with no additional inconvenience to the patient. This is particularly useful for patients who comply poorly with subcutaneous infusions.

The Desferrioxamine Mesylate for Injection solution should not be put directly into the blood bag but may be added to the blood line by means of a "Y" adaptor located near to the venous site of injection. The patient's pump should be used to administer Desferrioxamine Mesylate for Injection as usual. Patients and nurses should be warned against accelerating the infusion, as an intravenous bolus of Desferrioxamine Mesylate for Injection may lead to acute collapse (see Special warnings and special precautions for use).

Continuous intravenous infusion

Implanted intravenous systems can be used when intensive chelation is carried out. Continuous intravenous infusion is indicated in patients who are incapable of continuing subcutaneous infusions and in those who have cardiac problems secondary to iron overload. The dose of Desferrioxamine Mesylate for Injection depends on the extent of the patient's iron overload. The 24-hour urinary iron excretion should be measured regularly where intensive chelation (i.v.) is required, and the dose adjusted accordingly.

Care should be taken when flushing the line to avoid the sudden infusion of residual Desferrioxamine Mesylate for Injection which may be present in the dead space of the line, as this may lead to acute collapse (see Special warnings and special precautions for use).

Intramuscular administration

Since the subcutaneous infusions are more effective, intramuscular injections are given only when subcutaneous infusions are not feasible.

The maximum locally tolerated dose by intramuscular injection lies in the range 0.5 to 1.5 g. The volume of solution should be not less than 3 mL for each gram of desferrioxamine mesylate (ie reconstitute each 500 mg vial of DBL™ Desferrioxamine Mesylate for Injection BP with not less than 1.5 mL of Water for Injections).

Whichever route of administration is chosen, the individual maintenance dose to be selected will depend on the patient's iron excretion rate.

If the patient is normotensive, desferrioxamine mesylate may be given in a single intramuscular dose: 2g for an adult and 1g for a child. However, intravenous infusion is preferable since the rate of administration can be controlled and adapted to the patient's condition.

If the patient is hypotensive, the intravenous route is recommended. The maximum rate for intravenous administration is 15 mg/kg/hour and is reduced after four to six hours so that the total intravenous dose in general, does not exceed 80 mg/kg/24 hours. However, in an adult patient with severe iron poisoning, an infusion of desferrioxamine mesylate 37.1g over 52 hours has been tolerated without apparent unwanted effects.

Concomitant use of vitamin C

Patients with iron overload usually become vitamin C deficient, probably because iron oxidises the vitamin. As an adjuvant to chelation therapy, vitamin C in doses up to 200 mg daily may be given in divided doses, starting after an initial month of regular treatment with Desferrioxamine Mesylate for Injection (see Special warnings and special precautions for use). Vitamin C increases availability of iron for chelation. In general, 50 mg suffices for children under 10 years of age and 100 mg for older children. Larger doses of vitamin C fail to produce any additional increase in excretion of the iron complex.

Treatment for acute iron poisoning

Desferrioxamine Mesylate for Injection is an adjunct to standard measures generally used in treating acute iron poisoning.

Desferrioxamine Mesylate for Injection treatment is indicated in any of the following situations:

- all symptomatic patients inhibiting more than transient minor symptoms (e.g., more than one episode of emesis or passage of one soft stool),
- patients with evidence of lethargy, significant abdominal pain, hypovolaemia, or acidosis,
- patients with positive abdominal radiograph results demonstrating multiple radiopacities (the great majority of these patients will go on to develop symptomatic iron poisoning),
- any symptomatic patient with a serum iron level greater than 300 to 350 mcg/dL regardless of the total iron binding capacity (TIBC). It has also been suggested that a conservative approach without Desferrioxamine Mesylate for Injection therapy or challenge should be considered when serum iron levels are in the 300 to 500 mcg/dL range in asymptomatic patients, as well as in those with self-limited, non-bloody emesis or diarrhoea without other symptoms.

The continuous intravenous administration of Desferrioxamine Mesylate for Injection is the preferred route and the recommended rate for infusion is 15 mg/kg per hour and should be reduced as soon as the situation permits, usually after 4 to 6 hours so that the total intravenous dose does not exceed a recommended 80 mg/kg in any 24-h period.

The following suggested criteria are believed to represent appropriate requirements for cessation of Desferrioxamine Mesylate for Injection. Chelation therapy should be continued until all of the following criteria are satisfied:

- the patient must be free of signs or symptoms of systemic iron poisoning (e.g., no acidosis, no worsening hepatotoxicity),
- ideally, a corrected serum iron level should be normal or low (when iron level falls below 100 mcg/dL). Given that laboratories cannot measure serum iron concentrations accurately in the presence of Desferrioxamine Mesylate for Injection, it is acceptable to discontinue Desferrioxamine Mesylate for Injection when all other criteria are met if the measured serum iron concentration is not elevated,
- repeat abdominal radiograph test should be obtained in patients who initially demonstrated multiple radiopacities to ensure they have disappeared before Desferrioxamine Mesylate for Injection is discontinued because they serve as a marker for continued iron absorption,

- if the patient initially developed vin-rosé coloured urine with Desferrioxamine Mesylate for Injection therapy, it seems reasonable that urine colour should return to normal before halting Desferrioxamine Mesylate for Injection (absence of vin-rosé urine is not sufficient by itself to indicate discontinuation of Desferrioxamine Mesylate for Injection).

The effectiveness of treatment is dependent on an adequate output of urine in order to ensure that the iron complex ferrioxamine is excreted from the body. If oliguria or anuria develops, peritoneal dialysis, haemodialysis, or haemofiltration may become necessary.

Treatment for chronic aluminium overload in patients with end-stage renal failure

The iron and aluminium complexes of Desferrioxamine Mesylate for Injection are dialysable. In patients with renal failure their elimination will be increased by dialysis.

Patients with evidence of symptoms or organ dysfunction due to aluminium overload should receive Desferrioxamine Mesylate for Injection treatment. Even in asymptomatic patients, Desferrioxamine Mesylate for Injection treatment should be considered if serum aluminium levels are consistently above 60 ng/mL and are associated with a positive Desferrioxamine Mesylate for Injection infusion test (see below), particularly if bone biopsy findings present evidence of aluminium-related bone disease.

Desferrioxamine Mesylate for Injection should be administered as a once-weekly 5 mg/kg dose (see Instructions for use and handling). For patients with post-desferrioxamine (desferrioxamine) test serum aluminium levels up to 300 ng/mL Desferrioxamine Mesylate for Injection should be given as a slow i.v. infusion during the last 60 minutes of a dialysis session. For patients with a post-desferrioxamine test serum aluminium value above 300 ng/mL Desferrioxamine Mesylate for Injection should be administered by slow i.v. infusion 5 hours prior to the dialysis session. After completing the first 3-month course of Desferrioxamine Mesylate for Injection treatment, followed by a 4-week wash-out period, a Desferrioxamine Mesylate for Injection infusion test should be performed. If two successive Desferrioxamine Mesylate for Injection infusion tests performed at 1-month intervals yield serum aluminium levels less than 50 ng/mL above baseline, further Desferrioxamine Mesylate for Injection treatment is not recommended.

In patients on continuous ambulatory peritoneal dialysis (CAPD) or continuous cyclic peritoneal dialysis (CCPD) Desferrioxamine Mesylate for Injection should be given once weekly at a 5 mg/kg dose prior to the final exchange of the day. It is recommended that the intraperitoneal route be used in these patients. However, Desferrioxamine Mesylate for Injection can also be given i.m., by slow infusion i.v. or s.c..

Desferrioxamine Mesylate for Injection test

This test is based on the principle that in normal subjects Desferrioxamine Mesylate for Injection does not raise iron and aluminium excretion above a certain limit.

1. Desferrioxamine Mesylate for Injection test for iron overload in patients with normal kidney function

500 mg Desferrioxamine Mesylate for Injection should be injected intramuscularly. The urine should then be collected for a period of 6 hours and its iron content determined. An excretion of 1-1.5 mg (18-27 micromol) during this 6-hour period is suggestive of an iron overload; values of more than 1.5 mg (27 micromol) can be regarded as pathological. The test yields reliable results only in cases where renal function is normal.

2. Desferrioxamine Mesylate for Injection infusion test for aluminium overload in end-stage renal failure patients

A Desferrioxamine Mesylate for Injection infusion test is recommended in patients with serum aluminium levels exceeding 60 ng/mL associated with serum ferritin levels above 100 ng/mL.

Just before starting a haemodialysis session, a blood sample is taken to determine the baseline serum aluminium level.

During the last 60 minutes of the haemodialysis session a 5 mg/kg dose (see Instructions for use and handling) is given as a slow intravenous infusion.

At the start of the next haemodialysis session (i.e. 44 hours after the aforementioned Desferrioxamine Mesylate for Injection infusion) the second blood sample is taken to determine the serum aluminium level once more.

The Desferrioxamine Mesylate for Injection test is considered positive if an increase in serum aluminium above the baseline level exceeds 150 ng/mL. A negative test, however, does not absolutely exclude the diagnosis of aluminium overload.

In patients with terminal renal failure receiving haemodialysis, serum iron values should be determined before and after the administration of desferrioxamine mesylate 500 mg intramuscularly or intravenously. A continuous increase in serum iron during the following hours is suggestive of overload.

Contraindications

Known hypersensitivity to the active substance, except where successful desensitisation makes treatment possible.

Warnings and precautions

Rapid intravenous infusion may lead to hypotension and shock (e.g., flushing, tachycardia, collapse and urticaria).

High doses of Desferrioxamine Mesylate for Injection, especially in patients with low ferritin plasma levels, may lead to disturbances of vision and hearing (see Adverse effects). Patients with renal failure who are receiving maintenance dialysis and have low ferritin levels may be particularly prone to adverse reactions, visual symptoms having been reported after single doses of Desferrioxamine Mesylate for Injection. The risk of side effects is reduced when low-dose therapy is employed. If visual or auditory disturbances occur, the drug should be discontinued immediately. The changes induced by Desferrioxamine Mesylate for Injection are usually reversible if identified early. Treatment with Desferrioxamine Mesylate for Injection may be resumed later at a reduced dose, with close monitoring of audiovisual function.

Approximately half of the metal complex is excreted via the kidneys in iron-overloaded patients with normal renal function. Accordingly, in patients with severe renal failure caution is indicated. The iron and aluminium complexes of desferrioxamine are dialysable; in patients with renal failure their elimination will be increased by dialysis.

Patients with low serum ferritin levels on high doses of Desferrioxamine Mesylate for Injection, or patients at young age (< 3 years at commencement of treatment) have been associated with growth retardation (see Dosage and method of administration: "treatment for chronic iron overload"). Growth retardation if associated with excessive doses of Desferrioxamine Mesylate for Injection must be distinguished from growth retardation from iron overload. Growth retardation from Desferrioxamine Mesylate for Injection use is rare if the dose is kept below 40 mg/kg; if growth retardation has been associated with doses above this value, then reduction of the dose may result in return in growth velocity, however, predicted adult height is not attained.

Acute respiratory distress syndrome has been described following treatment with excessively high i.v. doses of Desferrioxamine Mesylate for Injection in patients with acute iron intoxication, and also in thalassaemic patients. The recommended daily doses should therefore not be exceeded.

In patients suffering from iron overload it has been reported that Desferrioxamine Mesylate for Injection increases susceptibility to infections, e.g. with *Yersinia enterocolitica* and *Yersinia pseudotuberculosis*. If a patient under treatment with Desferrioxamine Mesylate for Injection develops fever accompanied by acute enteritis/enterocolitis, diffuse abdominal pain, or pharyngitis, treatment should be temporarily discontinued, bacteriological tests performed, and suitable antibiotic therapy started at once. After the infection has resolved, treatment with Desferrioxamine Mesylate for Injection can be resumed.

In patients receiving Desferrioxamine Mesylate for Injection for aluminium and/or iron overload, very rare cases of mucormycosis, a severe fungal infection, have been reported. If any of the suspected signs or symptoms occur, Desferrioxamine Mesylate for Injection should be discontinued, mycological tests

carried out and appropriate treatment instituted immediately. Mucormycosis may also occur in patients who are not receiving Desferrioxamine Mesylate for Injection, indicating that other factor determinants such as dialysis, diabetes mellitus, disturbance of acid-base balance, haematological malignancies, immunosuppressive drugs, or a compromised immune system may play a role in the development of this infection.

Excretion of the iron complex may cause a reddish-brown discolouration of the urine.

Desferrioxamine Mesylate for Injection should not be given in doses higher than recommended. The drug should not be given at concentrations higher than a 10% solution in water for injection as this increases the risk of local reactions by the subcutaneous route (see Instructions for use and handling). Where intramuscular use is the only option it may be necessary to use higher concentrations to facilitate the injection.

At the recommended concentration of 10%, the reconstituted solution appears clear, and colourless to slightly yellowish. Only clear solutions should be used. Opaque or cloudy solutions should be discarded. Due care must be taken with the injection technique.

For subcutaneous infusion, the needle should not be inserted too close to the dermis.

In patients with severe chronic iron overload, impairment of cardiac function has been reported following concomitant treatment with Desferrioxamine Mesylate for Injection and high doses of vitamin C (more than 500 mg daily). The cardiac dysfunction was reversible when vitamin C was discontinued. The following precautions should be taken when Desferrioxamine Mesylate for Injection and vitamin C are to be used concomitantly:

- Vitamin C supplements should not be given to patients with cardiac failure.
- Start treatment with vitamin C only after an initial month of regular treatment with Desferrioxamine Mesylate for Injection.
- Give vitamin C only if the patient is receiving Desferrioxamine Mesylate for Injection regularly, ideally soon after setting up the pump.
- Do not exceed a daily dose of 200 mg of vitamin C, given in divided doses.
- Monitoring of cardiac function is advisable during such combined therapy.

Specialist ophthalmological and audiological testing are recommended before the start of Desferrioxamine Mesylate for Injection treatment and thereafter at regular intervals (every 3 months) particularly if ferritin levels are low. By keeping the ratio of the mean daily dose (mg/kg) of Desferrioxamine Mesylate for Injection divided by the serum ferritin (mcg/L) below 0.025 the risk of audiometric abnormalities may be reduced in thalassaemia patients.

Paediatric patients receiving Desferrioxamine Mesylate for Injection should be monitored for body weight and longitudinal growth every 3 months (see Special warnings and special precautions for use).

In patients with aluminium-related encephalopathy, high doses of Desferrioxamine Mesylate for Injection may exacerbate neurological dysfunction (seizures), probably owing to an acute increase in circulating aluminium. Desferrioxamine Mesylate for Injection may precipitate the onset of dialysis dementia. Pretreatment with clonazepam has been reported to prevent this neurological deterioration. Also, treatment of aluminium overload may result in decreased serum calcium and aggravation of hyperparathyroidism.

Pregnancy and Lactation

Desferrioxamine showed a possible teratogenic potential in rabbits (see Preclinical safety data). To date, all patients reported to have received Desferrioxamine Mesylate for Injection therapy during pregnancy have born children without any malformations. During pregnancy, especially in the first 3 months, it should only be employed if its use is mandatory.

It is not known whether desferrioxamine passes into the breast milk.

In each case the benefits for the mother must be weighed against the risks for the child.

Effects on ability to drive and use machines

Patients experiencing dizziness or other central nervous disturbances, or impairment of vision or hearing, should refrain from driving a vehicle or operating machines (see Adverse effects).

Other

The subcutaneous administration of high doses of desferrioxamine to rats, dogs and cats for several weeks caused eye-lens opacity with cataract formation.

Desferrioxamine did not show evidence for genotoxic/mutagenic effects in *in vitro* assays (Ames test) and *in vivo* assay (micronucleus test in rats). Long-term carcinogenicity studies have not been performed.

Desferrioxamine was not teratogenic in rats and mice. In rabbit foetuses, which were exposed in utero to maternally toxic doses, some malformations of the axial skeleton were found. Though the results of this study are considered of a preliminary character, desferrioxamine-induced teratogenicity in rabbits cannot be excluded under the experimental conditions employed.

Adverse effects

Frequency estimate: very common > 10%, common > 1% to < 10%; uncommon > 0.1% to < 1%; rare > 0.01% to < 0.1%; very rare < 0.01%.

Some of the signs and symptoms reported as adverse effects may also be manifestations of the underlying disease (iron and/or aluminium overload).

Local reactions / associated systemic reactions

At the injection site pain, swelling, induration, erythema, pruritus, and eschar/crust are very common, vesicles, local oedema and burning uncommon reactions. The local manifestations may be accompanied by systemic reactions like arthralgia/myalgia (very common), headache (common), urticaria (common), nausea (common), fever (common), vomiting (uncommon), abdominal pain (uncommon) or asthma (uncommon).

Allergy

Very rare: anaphylactic/anaphylactoid reactions with or without shock, angioedema.

Special senses

High-frequency sensorineural hearing loss, tinnitus are uncommon if doses are kept within guidelines and if doses are reduced when ferritin levels fall (ratio of the mean daily dose of Desferrioxamine Mesylate for Injection divided by the serum ferritin should be below 0.025); blurred vision, decreased visual acuity, loss of vision, impairment of colour vision (dyschromatopsia), night blindness (nyctalopia), visual field defects, scotoma, retinopathy (pigmentary degeneration of the retina), optic neuritis, cataracts (lens opacities), corneal opacities are rare, except if high doses are given (see Special warnings and special precautions for use).

Skin

Very rare: generalised rash.

Musculo-skeletal system

Growth retardation and bone changes (e.g. metaphyseal dysplasia) are common in chelated patients given doses of above 60 mg/kg, especially those who begin iron chelation in the first three years of life. If doses are kept to 40 mg/kg or below, the risk is considerably reduced. Leg cramps.

Pulmonary system

Very rare: acute respiratory distress syndrome (with dyspnoea, cyanosis, and interstitial pulmonary infiltrates) (see Special warnings and special precautions for use).

Central nervous system

Very rare: neurological disturbances, dizziness, precipitation or exacerbation of aluminium-related dialysis encephalopathy, peripheral sensory, motor or mixed neuropathy, paraesthesia (see Special warnings and special precautions for use).

Gastrointestinal system

Very rare: diarrhoea.

Renal system

Very rare: impaired renal function (see Special warnings and special precautions for use).

Cardiovascular system

Hypotension may occur if the recommended precautions for the administration of Desferrioxamine Mesylate for Injection are not followed (see Dosage and method of administration and Special warnings and special precautions for use).

Haematological system

Very rare: blood dyscrasias (e.g. thrombocytopenia).

Susceptibility to infections

In very rare cases Yersinia and Mucormycosis infections have been reported in association with Desferrioxamine Mesylate for Injection treatment (see Special warnings and special precautions for use).

Interactions

Concurrent treatment with Desferrioxamine Mesylate for Injection and prochlorperazine, a phenothiazine derivative, may lead to temporary impairment of consciousness.

In patients with severe chronic iron-storage disease undergoing combined treatment with Desferrioxamine Mesylate for Injection and high doses of vitamin C (more than 500 mg daily), impairment of cardiac function has been encountered (see Special warnings and special precautions for use); this proved reversible when the vitamin C was withdrawn.

Gallium-67-imaging results may be distorted because of the rapid urinary excretion of Desferrioxamine Mesylate for Injection-bound gallium 67. Discontinuation of Desferrioxamine Mesylate for Injection 48 hours prior to scintigraphy is advisable.

Overdosage**Signs and symptoms**

Inadvertent administration of an overdose or inadvertent intravenous bolus administration/rapid intravenous infusion may be associated with hypotension, tachycardia and gastrointestinal disturbances; acute but transient loss of vision, aphasia, agitation, headache, nausea, bradycardia, as well as acute renal failure have been reported.

Treatment

There is no specific antidote. Desferrioxamine Mesylate for Injection should be discontinued and appropriate symptomatic measures undertaken.

Desferrioxamine Mesylate for Injection is dialysable.

Pharmaceutical precautions**Instructions for Use/Handling**

Preparation and administration of solution For parenteral administration, DBL™ Desferrioxamine Mesylate for Injection BP should be reconstituted with Water for Injections (5 mL for the 500 mg vial and 20 mL for the 2 gram vial) to produce an approximate 10% solution (see below). However for IM administration, each 500 mg vial of DBL™ Desferrioxamine Mesylate for Injection BP may be reconstituted with not less than 1.5 mL of Water for Injections. The drug should be completely dissolved to produce a clear solution before use. DBL™ Desferrioxamine Mesylate for Injection BP 500 mg vials reconstituted with 5 mL will yield desferrioxamine mesylate concentrations of 93.5 mg/mL. (The displacement volume of DBL™ Desferrioxamine Mesylate for Injection BP is approximately 7% when reconstituted with 5 mL of Water for Injections BP).

For intravenous infusion, further dilution may be performed with 0.9% Sodium Chloride Intravenous Infusion, 5% Glucose Intravenous Infusion or Ringer's-Lactate Intravenous Infusion at a concentration of 1 to 8 mg/mL. For subcutaneous administration, the reconstituted solution may be given undiluted.

Dissolved desferrioxamine mesylate can also be added to the dialysis fluid and given intraperitoneally to patients on chronic ambulatory peritoneal dialysis or continuous cycling peritoneal dialysis.

Desferrioxamine is sometimes used for home infusions. If home use is to be instituted, it is important that patients and families be fully instructed on the safe and appropriate technique of administration.

The use of Desferrioxamine Mesylate for Injection in chronic iron overload by means of a portable infusion pump is described as follows:

1. Draw the water for injection into a syringe.
2. After cleaning the rubber stopper of the Desferrioxamine Mesylate for Injection vial with alcohol, inject the content of the syringe into the vial.
3. Shake the vial well to dissolve the drug.
4. Draw the dissolved drug into the syringe.
5. Attach the extension tube to the syringe, connect the extension tube to the butterfly-type needle, and then fill the empty space in the tube with the solution in the syringe.
6. Place the syringe into the infusion pump.
7. For infusion you may insert the butterfly-type needle under the skin of the abdomen, the arm, upper leg, or the thigh. It is important to clean the skin very thoroughly with alcohol before you insert the needle firmly up to the wings into a fold of the skin, formed by your free hand. The tip of the needle should move freely when the needle is waggled. If it doesn't move freely, the tip of the needle may be too close to the skin. Try again at a new site after cleaning it with alcohol.
8. Then fix the needle and tape it down.
9. Patients usually wear the pump on the body using a belt or shoulder holster. Many patients regard overnight use as the most convenient.

Incompatibilities

- Heparin injectable solution.
- Physiological saline (0.9 %) should not be used as a solvent for the dry substance; but, after reconstitution of the Desferrioxamine Mesylate for Injection solution with water for injection, it can be employed for further dilution.

Special Precautions for Storage (light storage)

Store below 25°C. Protect from light.

Medicine classification

- Prescription Medicine.

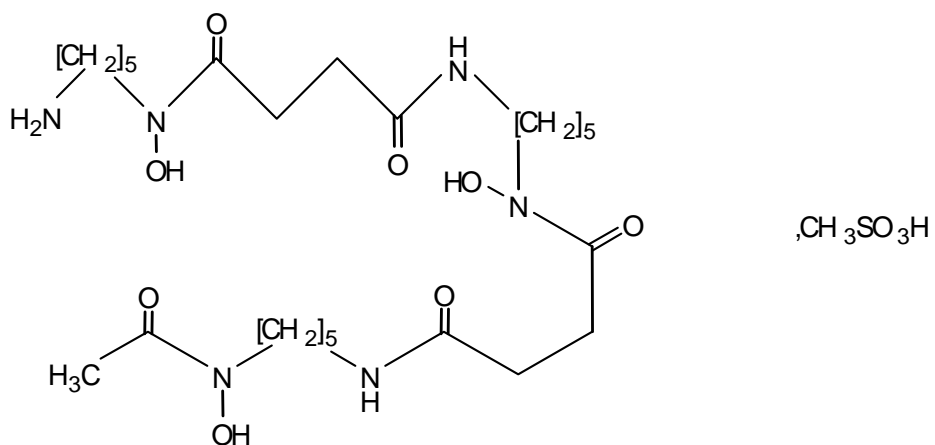
Package quantities

DBL™ Desferrioxamine Mesylate for Injection BP 500 mg is available in packs of 10 vials.

DBL™ Desferrioxamine Mesylate for Injection BP 2 g is available in packs of 1 vial.

Further information

Chemical name: 30-amino-3,14,25-trihydroxy-3,9,14,20,25-penta-azatriacontane-2,10,13,21,24-pentaone methanesulphonate. The molecular weight of desferrioxamine mesylate is 656.8, its Chemical Abstracts registry number is 138-14-7 and its chemical structure is shown below.

**Name and address**

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Date of preparation

7 December 2011