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## Magnesium Sulfate Injection, USP 50%

### For Intravenous or Intramuscular Use Only

500 mg/mL of Magnesium Sulfate heptahydrate  
4.06 mEq/mL of Magnesium Sulfate anhydrous  
4060 mOsmol/L  
pH 5.5 - 7.0 when diluted to a concentration  
of 5% (w/v)

### DESCRIPTION

Magnesium Sulfate Injection, USP 50% is a sterile, concentrated solution of magnesium sulfate in Water for Injection.

Each mL contains 500 mg magnesium sulfate heptahydrate (49.3 mg Mg<sup>++</sup> and 194.7 mg SO<sub>4</sub><sup>2-</sup>). pH adjusted with sulfuric acid or sodium hydroxide if necessary.

The solution contains no bacteriostatic agent or other preservatives.

Magnesium sulfate heptahydrate is chemically designated MgSO<sub>4</sub>•7H<sub>2</sub>O and occurs as a white, bitter, crystalline powder which is freely soluble in water.

### CLINICAL PHARMACOLOGY

Magnesium is the second most plentiful cation of the intracellular fluids. It is essential for the activity of many enzyme systems and plays an important role with regard to neurochemical transmission and muscular excitability. Deficiencies are accompanied by a variety of structural and functional disturbances.

Some of the effects of magnesium on the nervous system are similar to those of calcium. An increased concentration of magnesium in the extracellular fluid causes depression of the central nervous system (CNS). Magnesium has a direct depressant effect on skeletal muscle.

Abnormally low concentrations of magnesium in the extracellular fluid result in increased acetylcholine release and increased muscle excitability that can produce tetany.

Magnesium slows the rate of SA nodal impulse formation. Higher concentrations of magnesium (greater than 15 mEq/L) produce cardiac arrest in diastole.

Excess magnesium causes vasodilation by both a direct action on blood vessels and ganglionic blockade.

Magnesium is excreted principally by the kidney by glomerular filtration.

### INDICATIONS AND USAGE

Magnesium Sulfate Injection, USP 50% may be of therapeutic value in the following conditions:

- as a CNS depressant, primarily in preeclampsia and eclampsia of pregnancy;
- as an electrolyte replenisher for hypomagnesemia and magnesium deficiency to maintain normal neuromuscular irritability.

### CONTRAINDICATIONS

Magnesium Sulfate Injection, USP 50% should not be administered parenterally in patients with heart block or myocardial damage.

### WARNINGS

The principal hazard in parenteral magnesium therapy is the production of abnormally high levels of magnesium in the plasma. The most immediate danger to life is respiratory depression. A preparation of calcium, such as the gluconate or gluceptate, should be at hand for intravenous administration as an antidote.

Magnesium Sulfate Injection, USP 50% can cause fetal harm when administered to a pregnant woman. When Magnesium Sulfate Injection is administered to a toxic mother, the newborn is usually not compromised. When Magnesium Sulfate Injection is administered intravenously by a continuous infusion for longer than 24 hours before delivery, the possibility of the baby showing signs of neuromuscular or respiratory depression of the newborn should be considered, since fetal toxicity can occur. A baby with hypermagnesemia may require resuscitation and assisted ventilation. If this drug is used during pregnancy, or if the patient becomes pregnant while taking this drug, the patient should be apprised of the potential hazard to the fetus.

This product contains aluminum that may be toxic. Aluminum may reach toxic levels with prolonged parenteral administration if kidney function is impaired. Premature neonates are particularly at risk because their kidneys are immature, and they require large amounts of calcium and phosphate solutions which contain aluminum. Research indicates that patients with impaired kidney function, including premature neonates, who receive parenteral levels of aluminum at greater than 4 to 5 µg per kg per day accumulate aluminum at levels associated with central nervous system and bone toxicity. Tissue loading may occur at even lower rates of administration of TPN products and of the lock-flush solutions used in their administration.

### PRECAUTIONS

#### General

Administer with caution if flushing and sweating occurs. When barbiturates, narcotics or other hypnotics (or systemic anesthetics) are to be given in conjunction with magnesium, their dosage should be adjusted with caution because of additive CNS depressant effects of magnesium. A preparation of calcium salt should be readily available for intravenous injection to counteract potential serious signs of magnesium intoxication.

Since magnesium is excreted almost entirely by the kidneys, it should be given very cautiously in the presence of serious impairment of renal function.

#### Laboratory Tests

Magnesium Sulfate Injection, USP 50% should not be given unless hypomagnesemia has been confirmed and the serum concentration of magnesium is monitored. The normal serum level is 1.5 to 2.4 mEq/L.

#### Drug Interactions

When barbiturates, narcotics, hypnotics (or systemic anesthetics), or other central nervous system depressants are to be given in conjunction with magnesium, their dosage should be adjusted with caution because of the additive central nervous system depressant effects of magnesium.

Central nervous system depression and peripheral transmission defects produced by magnesium may be antagonized by calcium.

#### Pregnancy

See **WARNINGS**.

#### Nursing Mothers

It is not known whether this drug is excreted in human milk. Because many drugs are excreted in human milk, caution should be exercised when Magnesium Sulfate Injection, USP 50% is administered to a nursing woman.

#### Usage in Children

Safety and effectiveness in children have not been established.

### ADVERSE REACTIONS

Principal adverse reactions are related to the high plasma levels of magnesium and include flushing, sweating, hypotension, circulatory collapse, and cardiac and central nervous system depression. Respiratory depression is the most life-threatening effect.

### OVERDOSAGE

Hypermagnesemia is manifested by muscle weakness, hypotension, ECG changes, sedation, and confusion. As plasma concentrations of magnesium begin to exceed 4 mEq/L, the deep-tendon reflexes are decreased and may be absent at levels approaching 10 mEq/L. At 12 to 15 mEq/L, respiratory paralysis is a potential hazard; the respiratory effects can be antagonized to some extent by the intravenous administration of calcium salts. In cases of severe renal impairment, symptomatic hypermagnesemia may be an indication for dialysis. Although man usually tolerates high concentrations of magnesium in plasma, there are occasional instances when cardiac consequences may be seen in the form of complete heart block at concentrations well below 10 mEq/L.

Before the parenteral administration of each dose, the respiratory rate should be at least 16 per minute and urinary function should be adequate. In the event of overdosage, assisted ventilation must be provided until calcium can be given intravenously. Peritoneal dialysis or hemodialysis may be required in cases of extreme hypermagnesemia.

When Magnesium Sulfate Injection, USP 50% is administered parenterally in doses that are sufficient to induce hypermagnesemia, the drug has a depressant effect on the central nervous system and, via the peripheral neuromuscular junction, on muscle.

### DOSAGE AND ADMINISTRATION

#### Intramuscular

Adults and older children for severe hypomagnesemia 1 to 5 g (2 to 10 mL of 50% solution) daily in divided doses; administration is repeated daily until serum levels have returned to normal. If deficiency is not severe, 1 g (2 mL of 50% solution) can be given once or twice daily. Serum magnesium levels should serve as a guide to continued dosage.

#### Intravenous

1 to 4 g Magnesium Sulfate Injection, USP 50% may be given intravenously in 10% to 20% solution, but only with great caution; the rate should not exceed 1.5 mL of 10% solution or equivalent per minute until relaxation is obtained.

#### Intravenous Infusion

4 g in 250 mL of 5% Dextrose Injection, USP at a rate not exceeding 3 mL per minute.

#### Usual Dose Range

1 to 40 g daily.

#### Electrolyte Replenisher

Intramuscular 1 to 2 g in 50% solution four times a day until serum magnesium is within normal limits.

#### Usual Pediatric Dose

Intramuscular 20 to 40 mg/kg of body weight in a 20% solution repeated as necessary.

#### For Eclampsia

Initially 1 to 2 g in 25% or 50% solution is given intramuscularly. Subsequently, 1 g is given every 30 minutes until relief is obtained. The blood pressure should be monitored after each injection.

Parenteral drug products should be visually inspected for particulate matter and discoloration prior to administration whenever solution and container permit.

**AVAILABILITY OF DOSAGE FORMS**

<b>Product Number</b>	<b>Magnesium per mL</b>	<b>Sulfate per mL</b>	<b>Volume</b>
C96410P*	49.3 mg	194.7 mg	10 mL in a 20 mL vial
C6450	49.3 mg	194.7 mg	50 mL

\* Packaged in a plastic vial.

**No preservative added.** Unused portion of container should be discarded. Use only if solution is clear, and seal intact.

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