PRODUCT MONOGRAPH

MICRO I
(Sodium Iodide Injection)

100 µg/mL

Trace Element

Sandoz Canada Inc.
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CLINICAL PHARMACOLOGY

Iodine is an essential trace element in the human diet. It is an important factor in cellular oxidation processes and is necessary for the formation of thyroid hormones thyroglobulin, thyroxine and triiodothyronine. The manifestations of iodine deficiency are those of a deficiency of thyroid hormones. Where dietary iodine limits thyroid output, the basal metabolic rate is reversibly lowered.

The hypothalamus secretes the thyrotropin releasing factor, or TRF, a peptide which provokes the secretion of the thyroid stimulating hormone or TSH. TSH stimulates the thyroid gland to release its hormones and trap iodide. The thyroid hormones in turn inhibit the release of both TRF by the hypothalamus and TSH by the pituitary, thus keeping the plasma level of the thyroid hormones normal.

The fact that the thyroid hormones play an important role in animal metamorphosis, growth and cell differentiation suggests that these hormones have a primary effect on the control of gene expression.

Thyroid hormones and thus iodine are essential for growth during early life. Athyreosis can lead to a type of dwarfism found in severely goitrous areas, and can be treated with iodine administration.

Endemic goiter, when severe, is frequently associated with endemic cretinism, which is characterized by mental retardation, deafness and deafmutism, retarded growth, and neurological abnormalities, as well as hypothyroidism.

Thyroid hormones are important for the development of the gonads and secondary sex organs.

Changes in the skin and hair are among the most constant features of iodine deficiency.

Iodine concentrations in human foods vary with the availability of iodine in the soil or with the amount and nature of fertilizers applied. Overall iodine intakes are determined more by the source of foods composing dietaries than by the choice or proportion of different foods, except for those of marine origin, or where there is iodine enrichment such as iodized salt.

Iodine, as inorganic iodide, is absorbed rapidly and almost completely from all levels of the GI tract. Iodinated amino acids are more slowly and less completely absorbed, or are broken down and absorbed as iodide.

The healthy human adult body contains a total of 15-20 mg iodine, of which 70-80% is present in the thyroid gland. The skeletal muscles contain the next largest proportion of total body iodine. Iodine is also present in the pituitary gland, salivary glands, and bile. Iodine in the tissues is present in both inorganic and organically bound forms. The salivary iodine concentration is proportional to that of the plasma in organic iodine concentration. The protein-bound iodine of the serum (PBI), or the butanol extractable iodine (BEI) of the serum corresponds reasonably well with the level of thyroid activity in man. In adults the normal range of iodine levels has been placed at 4-8 or 3-7.5 μg/100 mL with a mean close to 5-6 μg/100 mL. Human colostrum has been reported to contain 50-240 μg/litre, with 40-80 μg/litre in human milk, once lactation is established.

The iodide pool is replenished continuously, exogenously from the diet, and endogenously from the saliva, the gastric juice, and the breakdown of thyroid hormones. The rate of removal of iodide from the plasma inorganic iodide pool by the thyroid and kidneys is expressed as thyroid and renal clearances. In normal man the total clearance occurs at the rate of about 50 mL/min, and renal iodide clearance is constant at about 35 mL/min over all ranges of plasma iodide examined. Thyroid clearance is sensitive to changes in plasma concentrations and varies with the activity of the gland. In normal adults, the thyroid clears 10-20 mL/min.

Iodine is excreted mainly in the urine, with smaller amounts appearing in the feces and sweat. The level of urinary iodine excretion correlates well with plasma iodide concentration and labelled iodine thyroid uptakes. The lower limit of normal urinary levels has been suggested to be 75 μg/g for adult men, 50 μg/g for adolescents, and 32.5 μg/g for children 5-10 years of age. Most of the hormonal iodine is degraded by the liver and the iodide returned to the body iodide pool, with little appearing in the feces.

During short term total parenteral nutrition (TPN), iodine deficiency is unlikely to occur, except perhaps in patients with long standing enteropathies; however, long term TPN may require supplementation with iodine.

INDICATIONS

Micro I (Sodium Iodide Injection) is indicated for use as a supplement to intravenous solutions given for TPN. This helps to maintain plasma iodine levels and to prevent depletion of endogenous stores of iodine and subsequent deficiency symptoms.

WARNINGS

Occasional sensitization to iodides may result in anaphylactic shock. Before sodium iodide is given intravenously, the tolerance of the patient should be evaluated.

Micro I is a hypotonic solution and should be administered in admixtures only.

PRECAUTIONS

Because iodide is excreted mainly in the urine, iodine supplements in TPN solutions may be adjusted, reduced or omitted in patients with renal dysfunction, to prevent iodide accumulation in the body.

Consideration should be given to other sources of iodine when determining dosages. Iodine is a constituent of several medications and diagnostic compounds. Iodine and povidone iodine used for topical or wound disinfection are readily absorbed through skin and mucous membranes. Iodine in coastal air is absorbed through the lungs.

ADVERSE REACTIONS

Iodine and iodides can produce goiter and hypothyroidism as well as hyperthyroidism. Goiter and hypothyroidism have also occurred in infants born to mothers who had taken iodides during pregnancy.

Iodine can give rise to allergic reactions which may include urticaria, angioedema, cutaneous haemorrhage or purpuras, fever, arthralgia, lymphadenopathy, and eosinophilia.

Prolonged administration may lead to iodism, although some of the effects could be considered to be due to hypersensitivity. These include adverse effects on the mouth such as metallic taste, increased salivation, burning or pain, and coryza; there may be swelling and inflammation of the throat. Eyes may be irritated and swollen. Pulmonary oedema may develop. Skin reactions include acneform or severe eruptions (ioderma). Other reported effects include gastro-intestinal upsets and diarrhoea.

Symptomatic treatment may be required for allergic reactions and iodism, although symptoms usually subside rapidly when administration of iodine is discontinued.

OVERDOSAGE

The symptoms of acute poisoning from ingestion of iodine are mainly due to its corrosive effects on the gastro-intestinal tract; a disagreeable metallic taste, vomiting, abdominal pain, and diarrhoea occur. Anuria may occur 1 to 3 days later; death may result from circulatory failure, edema of the glottis resulting in asphyxia, aspiration pneumonia, or pulmonary

oedema. Oesophageal stricture may occur if the patient survives the acute stage. The fatal dose is usually 2 or 3 g.

Acute iodine poisoning should be treated with abundant fluids and electrolytes. The symptoms of iodism disappear soon after administration of the drug is discontinued.

DOSAGE AND ADMINISTRATION

Dosage

For adults who are metabolically stable and receiving TPN, the recommended dosage level is 1 to 2 μg iodide/kg/day. For normal adults this would be 75-150 μg/day.

For pregnant or lactating mothers, and growing children, the recommended dosage level is 2 to 3 μg iodide/kg/day.

Administration

Serum levels of inorganic iodide for healthy subjects are 0.08 to 0.60 μg/100 mL. Thyroid function is a more realistic indication of iodine requirements, with the protein-bound iodine (PBI) or butanol extractable iodine (BEI) of the serum corresponding reasonably well with the level of thyroid activity; limits of normality have been placed at 3-8 μg/100 mL of serum.

Micro I is for intravenous use after dilution only.

Micro I should be aseptically added to the TPN solution under the laminar flow hood.

The iodine present in **Micro I** is physically compatible with electrolytes and vitamins usually present in the amino acid/dextrose solution used for TPN.

Visually inspect parenteral drug products for particulate matter and discolouration prior to administration whenever container and solution permit.

PHARMACEUTICAL INFORMATION

Drug Substance

Chemical Name:	Sodium Iodide
Molecular Formula:	NaI
Molecular Weight:	149.89
Description:	Sodium iodide occurs as colourless, odourless crystals, or white crystalline powder. It is deliquescent in moist air, and develops a brown tint upon decomposition. It is very soluble in water, and freely soluble in alcohol and in glycerin.

Composition
Micro I is a sterile solution of sodium iodide, equivalent to 100 μg/mL of iodide, in water for injection. Sodium hydroxide is used to adjust the pH.

Stability and Storage Recommendations
Store at controlled room temperature not exceeding 28°C. Do not freeze. Protect from light.

Dilution for Intravenous Use
Aseptic addition of **Micro I** to the TPN solution under a laminar flow hood is recommended.

The iodine in **Micro I** is physically compatible with the electrolytes and vitamins usually present in the amino acid/dextrose solution used for TPN. After dilution, the solution must be used within 24 hours.

Inspect for particulate matter and discolouration prior to administration whenever solution and container permit.

AVAILABILITY

Micro I, 100 μg iodide/mL, is available in single dose 10 mL amber glass vials, boxes of 10.

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