

## Potassium iodide in dermatology

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### INTRODUCTION

*“Because the newer methods of treatment are good, it does not follow that the old ones are bad: For if our honorable and worshipful ancestors had not recovered from their ailments, you and I would not be here today”.*  
[Confucius]

Iodine was first discovered in seaweeds about two centuries ago and was used medically for a variety of conditions such as thyroid disorders, syphilis, psoriasis and atopic dermatitis. It is most conventionally used as a saturated solution of potassium iodide (KI).

KI has been primarily used in the treatment of endemic goiter and is usually given for this purpose as iodized salt. Other indications include treatment of hyperthyroidism, radiation protectant of thyroid gland and preoperative preparation of patients with Grave's disease. It is also used for the treatment of some dermatological conditions such as cutaneous sporotrichosis and various inflammatory dermatoses.

### PHARMACOLOGY

KI is medicinally supplied in 130 mg tablets for emergency purposes. KI may also be administered as a

“saturated solution of potassium iodide “ (SSKI) which contains 1000 mg of KI per ml of solution. Each drop of SSKI is assumed to contain about 50 mg iodine as iodide. In order to prepare SSKI, KI is added to hot purified water, using sodium thiosulphate as a preservative. Since the solubility of KI in water at room temperature is about 1.40-1.48 g/ml pure water, and the resulting solution has a density of about 1.72 g/ml, this process also results in a final concentration of KI of about 1000 mg KI/ml of saturated KI solution, and also contains essentially the same concentration of iodide per drop as does the U.S.P. formulation. KI solution is usually added to water, fruit juice or milk before drinking in order to prevent gastrointestinal irritation. SSKI should be stored in tight, light-resistant containers at a temperature of 15–30°C. Crystallization may occur following exposure to cold. Crystals dissolve with warming and shaking of solution. The color of KI solution in water is bright yellow. If the solution turns brownish yellow, it should be discarded.

KI is well absorbed orally and distributed selectively into thyroid gland. It also distributes to a minor extent into the salivary glands, breast, choroid plexus and gastric mucosa. It readily crosses the placenta and is distributed into milk. It is not concentrated in the thyroid gland and is excreted mainly in urine.

### MECHANISM OF ACTION

The exact mechanism of action of KI in dermatological diseases is not known. Since KI appears to be particularly effective in those conditions where neutrophils predominate, it was speculated that it acts because of its effects on neutrophils. In 1982, Miyachi and Niwa noted that KI suppresses the ability of the neutrophils to generate the toxic oxygen intermediates hydrogen peroxide and hydroxyl radicals *in vitro*.<sup>[1]</sup> Honna *et al.*, in 1990 found that KI has an inhibitory effect on neutrophilic chemotaxis.<sup>[2]</sup>

The mode of action of KI on various fungi has not yet been established. The direct action of KI on the fungus

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has been denied and the activation of macrophages by iodine has now been assumed to be responsible for the healing effect. KI apparently does not have a direct action on *Sporothrix Schenckii*. The spontaneous healing and the variability of the clinical presentation in the disease have strengthened the idea that KI rather interacts with the immune response of the host.

## INDICATIONS

### Sporotrichosis

KI was first used in early 20<sup>th</sup> century for this condition and continues to be used even today because of its effectiveness and low cost. It has shown good results in the treatment of fixed cutaneous sporotrichosis and lymphocutaneous sporotrichosis.<sup>[3-5]</sup>

For adults, initially, 250 mg (approximately 5 drops of a 1-g/ml solution) is administered three times a day.<sup>[6]</sup> Gradually the dosage is increased as tolerated to a maximum of 2-2.5 g (approximately 40-50 drops of a 1-g/ml solution) three times daily for 6-10 weeks.<sup>[7]</sup>

Treatment with KI should be stopped if signs of iodism appear or a hypersensitivity develops to KI. In children, a maximum of 1.25-2 g (approximately 25-50 drops of a 1-g/ml solution) is administered thrice a day.<sup>[8,9]</sup> Once daily dose is as efficacious as three times dosing and has an improved compliance, especially in children for the treatment of sporotrichosis.<sup>[10]</sup>

However, where available, Itraconazole has replaced KI use for the treatment of sporotrichosis.<sup>[11,12]</sup> KI is considered as an alternative therapy because of the problems with long-term compliance (i.e, numerous side effects, lack of solid oral dosage form). KI has not been found to be effective for the treatment of extracutaneous (pulmonary, extraarticular, meningeal) sporotrichosis or disseminated sporotrichosis. Amphotericin B or Itraconazole are considered the drugs of choice for these forms of sporotrichosis.

### Other varieties of subcutaneous mycosis

KI has been successfully used in cases of subcutaneous phycomycosis,<sup>[13-15]</sup> human pythiosis,<sup>[16]</sup> nocardia brasiliensis,<sup>[17]</sup> cutaneous cryptococcosis<sup>[18]</sup> and rhinoentomophthoromycosis<sup>[19]</sup> (rhinophycomycosis).

### Panniculitis

KI has been found to be effective in erythema nodosum and nodular vasculitis.<sup>[20-22]</sup> The adult dosage of

KI in these disorders is 300-900 mg per day. Relief of symptoms such as local tenderness, fever and arthralgias occurs within 24-48 hrs while as the clearing of lesions occurs within a period of 10-14 days.

A rapid response to KI has also been reported in cases of subacute nodular migratory panniculitis (erythema nodosum migrans).<sup>[23,24]</sup>

### Neutrophilic dermatoses

KI has also been tried in Sweet's syndrome<sup>[25]</sup> and pyoderma gangrenosum. Sanburg and Benzie described a patient with Crohn's disease and pyoderma gangrenosum whose skin lesions healed after KI treatment.<sup>[26]</sup> Richardson and Callen also showed its effectiveness for the treatment of recalcitrant pyoderma gangrenosum.<sup>[27]</sup> In these conditions, KI has been found to be effective in a dose of 300 mg three times a day. KI should be used as an alternate choice for the treatment of neutrophilic dermatoses when other treatments fail, are contraindicated, or cause intolerable side effects.

### Wegener's granulomatosis

Corticosteroids when used in combination with KI (800 mg per day) cause a rapid resolution and clearing of lesions within 3 months.<sup>[28]</sup>

### Miscellaneous uses

Other dermatological conditions where KI has been found to be useful include erythema multiforme, Behcet's syndrome, disseminated granuloma annulare.<sup>[29]</sup>

## SIDE EFFECTS

1. Common side effects include stomach upset, diarrhea, nausea, vomiting, stomach pain. These acute side effects go away during treatment as the body adjusts to the medicine or can be lessened by avoiding rapid dosage increases. Other less common side effects include urticaria and angioedema.
2. Iodism:- Iodism (chronic iodine poisoning) may occur following long - term therapy or with the use of high dosages. Manifestations include burning in the mouth or throat, severe headache, metallic taste, soreness of teeth and gums, coryza, sneezing, eye irritation with eyelid swelling, unusual increase in salivation, confusion, arrhythmias, numbness and weakness. If manifestations of iodism

occur, discontinue KI and initiate appropriate supportive therapy. Symptoms usually resolve soon after the discontinuation of drug. Abundant fluid and salt intake may help eliminate iodide.

3. Productive cough, pulmonary edema, swelling/tenderness of parotid and submaxillary glands, inflammation of pharynx/larynx/tonsil may occur.<sup>[30]</sup>
4. Hypersensitivity reactions:- Angioedema, cutaneous and mucosal hemorrhage, signs and symptoms resembling serum sickness (e.g, fever, arthralgias, lymph node enlargement, eosinophilia) may occur. Urticaria, thrombotic thrombocytopenic purpura and fatal periarteritis may occur. Patients with hypocomplementemic vasculitis associated with chronic urticaria or SLE are at an increased risk of developing severe systemic illness.<sup>[31]</sup> If hypersensitivity occurs, discontinue therapy.
5. Cutaneous side effects:- These include:
  - a) Acneiform eruption
  - b) Iododermas<sup>[32]</sup> - erythematous, vesicular, bullous, urticarial, nodular or vegetating lesions on face, shoulder and extremities
  - c) Aggravation of dermatitis herpetiformis.<sup>[33]</sup>
6. Rare side effects:- a) Periarteritis nodosa<sup>[34]</sup> e) Pustular psoriasis<sup>[35]</sup> and f) Granulomatous vasculitis.<sup>[36]</sup>

## DRUG INTERACTIONS

*ACE inhibitors*:- Hyperkalemias, cardiac arrhythmias, cardiac arrest.

*Antithyroid drugs*:- Possible potentiation of hypothyroid and goitrogenic effects of antithyroid drugs.

*Potassium sparing diuretics*:- Hyperkalemia, cardiac arrhythmias, cardiac arrest.

*Lithium*:- Possible additive or synergistic hypothyroid effects.

*Amiodarone and sulphonamides*:- Potentiation of hypothyroidism.

## SPECIAL SITUATIONS

- A. Pregnancy:- KI is a pregnancy category D drug. Short-term therapy is used by some clinicians without any evidence of adverse fetal effects.

Long-term therapy is considered by most clinicians to be contraindicated.<sup>[37]</sup>

- B. Lactation:- Since KI is distributed into milk, a possible rash and thyroid suppression in infants can occur. AAP considers KI to be compatible with breast feeding.<sup>[38]</sup>
- C. Patients with alteration in thyroid function:- Long-term use with KI may induce hyperthyroidism or hypothyroidism.<sup>[39,40]</sup> So caution is warranted while administering KI in patients with pre-existing thyroid disorders (multinodular goiter, Grave's disease, autoimmune thyroiditis).
- D. Concomitant illness:- KI should be used with caution in patients with Addison's disease, cardiac disease, myotonia congenita or renal impairment.

## CONTRAINDICATIONS

- a. Known hypersensitivity to KI.
- b. Hypocomplementemic vasculitis.<sup>[31]</sup>
- c. Dermatitis herpetiformis.<sup>[33]</sup>
- d. Nodular thyroid diseases (e.g, multinodular goiter)<sup>[39]</sup>
- e. Active tuberculosis.

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