

UNITED STATES PATENT OFFICE

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ACTIVATED IODINE THERAPEUTIC AGENT

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This invention relates to therapeutic agents and more particularly to a therapeutic agent containing iodine. The invention further relates to therapeutic agents adapted for the treatment of fungus infections of the scalp and of the skin, and particularly to tinea tonsurans, ringworm of the groin and ringworm of the feet or "athlete's foot."

Various treatments have heretofore been proposed for fungus infections of the skin and of the scalp but none of these have proven satisfactory. Difficulties have arisen particularly because in certain types of treatment the hair cells are destroyed, resulting in permanent baldness of the scalp areas subjected to treatment, or in other instances the results obtained have not justified continuance of the treatment. In other instances the irritating nature of the treatment or of the agents employed has resulted in severe discomforts and dissatisfaction.

It has heretofore been recognized that iodine has, for the ringworm fungi, fungistatic and fungicidal properties, but no wholly satisfactory provisions have heretofore been made for utilizing the iodine in an effective manner without irritation or injury of the skin and body tissues upon application.

In accordance with the present invention, the fungicidal properties of iodine are utilized but with an enhanced or intensified action not heretofore obtained and without irritation of the skin and body tissues.

In order to utilize the properties of the iodine in a more effective manner the iodine is combined with a catalyst, in a suitable environment, and in a suitable vehicle for local application.

In order to intensify and augment the action of the iodine as a fungicidal agent chlorophyll is employed as a catalyst and photosensitizer as it possesses the required characteristics of accelerating the chemical reaction, while itself remaining unaltered, and because of its function as a photosensitizer in promoting oxidation by oxygen present in the therapeutic agent.

The photodynamic action desired requires a source of oxygen, and also that iron be present. While any suitable sources of oxygen and iron may be employed, capable of providing the oxygen required for the occurrence of the photodynamic process, it has been found that red blood cells, of human or animal blood, are satisfactory because of their oxygen carrying capacities and also because the iron containing compound heme, which goes to make up the hemoglobin of the red blood cells, supplies the iron which is also

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essential to the progress of the photodynamic process.

An additional source of oxygen is preferably employed and for this purpose magnesium peroxide has been found satisfactory.

Photodynamic processes also require a source of energy and for this purpose a quartz-mercury arc, with most of its energy in the 2600 to 2900 Å level, is employed as hereinafter pointed out.

The therapeutic agent in accordance with the present invention is preferably prepared by combining the ingredients in the manner hereinafter pointed out, it being understood that the proportions may be varied and substitutions made without departing from the spirit of the invention.

As an illustration of a specific example of the preparation of a therapeutic agent in accordance with the present invention, a measured quantity of iodine crystals and a measured quantity of a source of oxygen, such as magnesium peroxide, are mixed in one vessel in dry form. In another vessel measured quantities of red blood cells in normal salt solution, a catalytic agent in liquid form such as chlorophyll, and a wetting agent, such as dioctyl ester of sodium sulfosuccinic acid which is distributed under the trade name "Deceresol," are mixed and combined. The quantities employed are preferably as follows:

30	In the first vessel:	Per cent by weight
	Iodine	80.0
	Magnesium peroxide	0.8
	In the second vessel:	
35	Red blood cells.....	17.0
	Sodium chloride	0.2
	Chlorophyll	0.07
	Wetting agent, dioctyl ester of sodium sulfosuccinic acid	1.0

40 The materials in the two vessels are brought together and intimately mixed and the mixture is kept under an ultra-violet light, such as from the energy source referred to above, until dry, this drying ordinarily requires from three to five days. This iodine containing residue thus obtained is reddish-black and contains about 15% by weight of iodine and about 0.8% by weight of inorganic material. The iodine containing material is then ground up and is incorporated in a suitable vehicle or dispersing material, cottonseed oil having been found satisfactory for this purpose. The iodine containing material and cottonseed oil are preferably in the proportions of one half drachm to one ounce, respectively.

While it is not entirely certain as to the action which takes place, it appears likely that the iodine molecule is capable, in the presence of the photosensitizing agent, of having energy of activation transferred thereto from the photosensitizer molecules of chlorophyll. In this manner the iodine molecule in the presence of the chlorophyll and with iron and oxygen present becomes an activated molecule and thereby capable of more intensive action and effect. There may also be a promotion of oxidation by the chlorophyll in its role as a photosensitizer as well as some generation of ozone by the ultra-violet light.

In the treatment of tinea tonsurans the hair of the scalp is clipped and is kept short. Successive topical applications are employed consisting of acetic acid, 3% solution, and the iodine combination.

First, the acetic acid is rubbed into the scalp using a small brush, such as a tooth brush, for about two minutes, with special attention to the infected areas. Acetic acid of such strength reduces the activity of the ringworm fungus and has proven efficient and non-irritating. The application of the acetic acid is followed by bringing an electric light bulb of 150 to 200 watt size sufficiently close to the scalp to impart a distinct sensation of heat.

The iodine material is then rubbed into the scalp by hand or with a small brush, such as a tooth brush, for about two minutes, followed by application of the electric bulb as before, for about six minutes. The use of the electric bulb possibly induces some vaporization of the iodine.

The therapeutic agents employed have been found effective in treatment of ringworm of the scalp of the *Microsporon audouini* type, and also of the *Trichophyton gypseum* variety.

The criteria used for determination of a cure consisted of direct examinations of the suspected hair and observation of the scalp hair with filtered ultra-violet light. Three consecutive negative observations by both methods made at four to five day intervals were considered essential before the persons treated could be regarded as cured.

The iodine containing material is also suitable for use in the treatment of fungi infections, other than those of the scalp, which do not require as detailed preliminary preparations.

I claim:

1. A therapeutic agent for topical application comprising iodine activated by ultra-violet light in the presence of chlorophyll, heme as a source of iron, and a material continuously evolving oxygen.

2. A therapeutic agent for topical application comprising iodine activated by ultra-violet light in the presence of chlorophyll, hemoglobin, and a material continuously evolving oxygen.

3. A therapeutic agent for topical application comprising iodine activated by ultra-violet light in the presence of chlorophyll, red blood cells, and magnesium peroxide.

4. A therapeutic agent for topical application comprising iodine activated by ultra-violet light in the presence of chlorophyll, heme as a source of iron, and a material continuously evolving oxygen, the activated iodine being distributed in an oily vehicle.

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