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DL-METHIONINE AND THIOUREA AS PHOTOSTABILIZERS FOR SATURATED SOLUTION OF POTASSIUM IODIDE

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ABSTRACT

Saturated solution of potassium iodide suffers from coloration on exposure to light due to the liberation of iodine. DL-methionine and thiourea in a concentration range from 5 to 25 mg% demonstrated an outstanding photostabilizing action for potassium iodide solution when stored for two hours under high intensity fluorescent light. Decrease of concentration of either DL-methionine or thiourea below 25 mg% appeared to have no effect on their stabilizing action during this short-term storage. Saturated solution of potassium iodide containing 25 mg% of DL-methionine remained colorless after exposure to light for 118 hours, whereas solution containing 25 mg% of thiourea developed only a faint yellow color. The photostability of potassium iodide solution was monitored by measuring the increase in absorbance at 353 nm.

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INTRODUCTION

Aqueous solutions of potassium iodide become colored on exposure to light due to the liberation of iodine. Ascorbic acid in a concentration of 0.018% was suggested to prevent discoloration of potassium iodide solutions (1). The USPXXI-NFXVI (2) allows the incorporation of 50 mg% of sodium thiosulfate to guard against discoloration of potassium iodide oral solution. However, such solution has been reported to precipitate out sulfur crystals (3).

Thiourea and methionine were used by Asker et al. (4) as photostabilizing agents for reserpine solutions. Therefore, it appeared worthwhile to investigate the influence of these two photoprotective agents on photodegradation of Potassium Iodide Oral Solution USPXXI-NFXVI.

The absorption spectrum of iodine in aqueous potassium iodide solutions shows a peak at 353 nm (5) which Benesi and Hildenbrand (6) attribute to triiodide ion formed by interaction of iodine functioning as an acid with iodide ion functioning as a base. Therefore, the increase in absorbance at 353 nm of potassium iodide solution as a result of liberation of iodine can be followed to monitor the photodegradation of potassium iodide solution.

EXPERIMENTAL

Materials: Potassium iodide, iodine, DL-methionine and thiourea were obtained from commercial sources in pharmaceutical or reagent grade and were used without further purification.

Equipment: The following were used: a light-stability cabinet equipped with two 30-inch, 40 watt Sylvania fluorescent lamps to serve as the light source.

Exposure to Light: Solutions contained in 1-ounce flint glass prescription bottles were placed 7 cm from the light source in the light-stability cabinet. The light intensity was maintained at 1350 foot candles.

Procedures:

Solutions for Light Exposure: Saturated solutions of potassium iodide with and without the photoprotective agents were placed in 1-ounce flint glass prescription bottles and exposed to light. Solutions of the photostabilizes were also exposed to light to serve as blanks. Concentration of the photoprotective agents used were 5, 10 and 25 mg%. Duplicate 1-ml samples were withdrawn from each bottle and were appropriately diluted with distilled water before reading the absorbance at 353 nm against the appropriate blanks. The average absorbance was recorded. The absorbance of KI_3 was found to obey Beer's law from a calibration curve prepared by adding various concentration of iodine to 50% solution of potassium iodide.

DISCUSSION OF RESULTS

It is evident from Figure 1 that the triiodide ion was progressively formed during exposure to light as a result of the liberation of iodine. However, no triiodide ion appeared to be formed in potassium iodide solutions containing either DL-methionine or thiourea. These solutions remained colorless and demonstrated virtually no absorbance at 353 nm. On the other hand saturated solution of potassium iodide free of these two stabilizers developed a yellowish brown color due to the liberation of iodine. Decrease of concentration of either thiourea or DL-methionine below 25 mg% appeared to have no effect on their photostabilizing action during the 2-hour exposure period. Preliminary study of long-term exposure to light for 118 hours showed that potassium iodide solution containing 25 mg% of DL-methionine remained colorless whereas

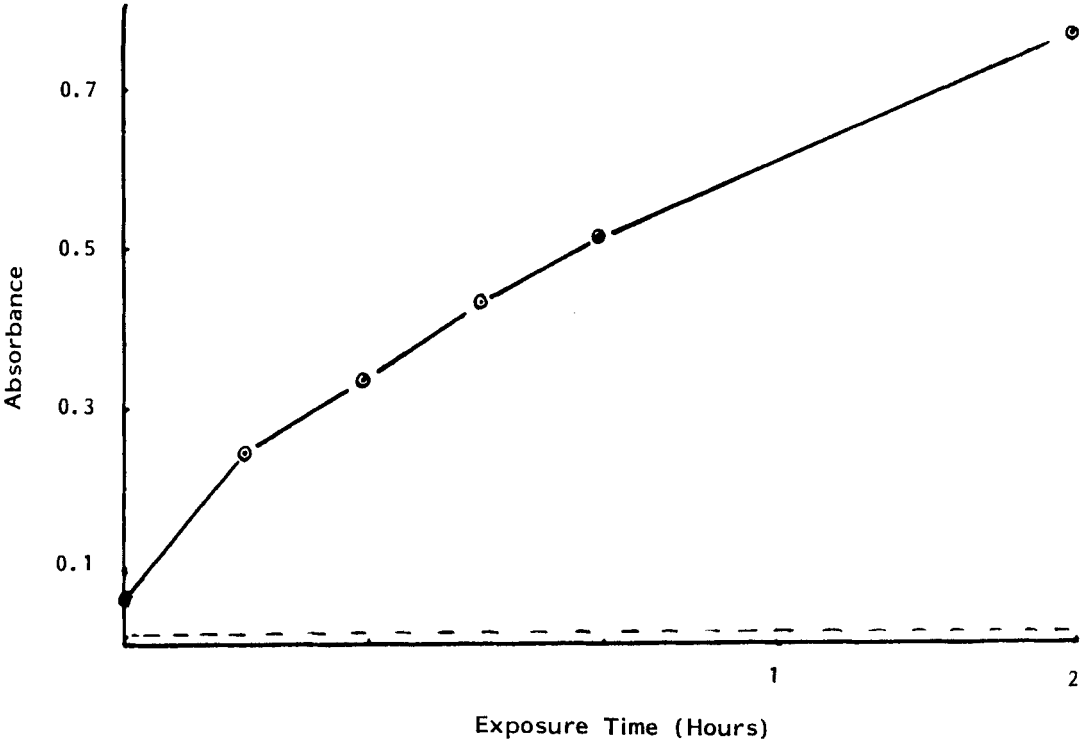

FIGURE 1

Effect of DL-methionine and thiourea on the photostability of saturated solution of potassium iodide. Key: ⊙ - Saturated solution of potassium iodide, --- Saturated solution of potassium iodide + 25 mg% of either DL-methionine or thiourea.

solution containing 25 mg% of thiourea developed a very faint yellow color. On the other hand solution of potassium iodide free of these stabilizers developed a dark yellowish brown color.

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