New Laboratory Technique

SPECTROPHOTOMETRIC DETERMINATION OF IODIDE IN BLOOD AND URINE

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Abstract

Palladium Chloride when treated with Iodide produces a complex of brownish yellow colour. This reaction has been utilized for the determination of Iodide in blood and urine. The maximum absorbance of the colour is at 380 nm. Carboxy Methyl cellulose is used to avoid any turbidity appearing in the solution. The maximum relative standard deviation is 1.5 when a 198 ug sample was taken. The method is precise, accurate and applicable.

Introduction

The iodine metabolism is of great importance because this is used in the formation of thyroid hormone. The daily recommended intake for adults is 100-200 ug and for children it is about 50 ug per day. The requirement during pregnancy is probably more.

Iodides are excreted by the kidneys, liver, lungs, therefore, urinary and blood iodides may give an indication about various diseases i.e. thyroid disorders, pregnancy and of iodide poisoning. In Hyperthyroidism the amount of iodide in urine and blood is sufficiently high. In some other diseases like stomach and gastrointestinal disorders, iodides are given as medicine. 7-Iodo-8 Hydroxy quinoline 5 sulphonic acid which is generally known as chinifon contains about 27.5% iodine. When given to a patient it is well absorbed from the gastroinestinal tract, with peak blood level reached within 2 hours. Therefore its level is very important to be checked. In 48 hours about 18% Iodine is excreted in the urine.. Similarly Vioform which has chemical name as 5-Choloro-7-iodo-8-hydroxy quinoline has iodide content of about 40%. It shows a greater absorption in terms of Iodine in blood, then chinifon. On repeated oral doses to man the peak blood concentration appeared to be reached not later than seventh day. Lot of it is excreted in urine in organic form and also in inorganic form. The iodine content in Yodoxin (5,7-Di iodo-8 hydroxy quinoline) is about 62%. Single dose given orally is quickly absorbed from gastrointestinal tract. A large amount of iodine (about 98%) is excreted in urine. In such cases, it is very important to check the iodide levels in blood and urine.

There are not very many methods for the trace determination of iodides. Generally the methods suffer from the disadvantage that bromides and chlorides also interfere in the procedure (Barbour et al., 1936). Barkat and coworkers (1972) determined iodides in biological fluids by titrimetric method, but this method has limitations because of the interference due to sulfite, hydro-sulfite and thiosulfate. An easy volumetric method for the determination of iodide has the disadvantage that it cannot be applied to microamounts.

Experiment

Reagents

Urine : One hundred mls of urine were taken and a few drops of glacial acetic acid were added to preserve it.

Blood : 100 ml of blood was taken in a bottle containing 3 grams of Sodium citrate.

Potassium Iodide : An exactly weighed amount (200 mg) of A.R. Potassium Iodide was dissolved in 100 ml of distilled water.

Palladium Chloride : 0.1% solution was prepared in dilute Hydrochloric acid.

Carboxy Methyl Cellulose : 1% solution was prepared by adding the reagent to boiling distilled water.

Zinc Sulphate : A 5% solution of the A.R. Grade reagent was prepared.

Barium Hydroxide : A 4.5% solution was prepared.

Equipment

All measurements were made with a UNICAM SP 600 Spectro-Photometer at 380 nm. Graduated pipettes of 1.5 and 10 ml capacity were used.

Procedure for Urine

1 ml, 2 ml and 5 ml portions of the urine solution were taken in 25 ml measuring flasks. A known amount of Iodide was then

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added followed by addition of 2 ml of 1% CMC solution and about 1 ml of Palladium chloride solution. A brownish yellow colour was developed. The volume was then made up to the mark with distilled water and the absorbance was measured at 380 nm in each case.

Procedure for Blood

1 ml aliquot of the blood containing a known amount of Iodide was centrifuged with 9.5 ml of Barium hydroxide solution and 9.5 ml of Zinc sulphate solution in a centrifugal machine for 5 minutes. The filtrate was collected in a 50 ml flask. Two to three washings were given with distilled water. 2 ml of 1% Carboxy Methyl Cellulose and 1 ml of 1% Palladium chloride were added until the colour developed. The absorbance of this resulting colour was measured at 380 nm.

Results and Discussion

Table I : Determination of Iodide in Urine

Amount (ug) Taken	*Amount of iodine recovered*	*Relative Standard Deviation %*
80	80	0.00
120	119	0.83
158	157	0.63
237	237	0.05

* Every result is the average of five readings.

Table II : Determination of Iodide in Blood

Amount (ug) Taken	*Amount of iodine recovered*	*Relative Standard Deviation %*
198	195	1.5
297	298	0.33
400	405	1.25
495	490	1.01

* Every result is the average of five readings.

The reaction between Iodide and Palladium Chloride is (Mellor 1964) as shown below :

$$PdCl_2 + 4\,I \longrightarrow (PdI_4)^{-2} + 2\,Cl$$

The $(PdI_4)^{-2}$ is a brownish yellow complex. It is quite evident from Table I and II that the recovery of iodide from urine and blood is more than 98%. Therefore, the present spectrophotometric method offers good scope for the determination of iodides. It is convenient, rapid, accurate and precise. Microamounts of iodide can be determined.

References

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