JOURNAL OF NUCLEAR MEDICINE 8:226-228, 1967

Comparison of Adsorption of Iodine-131-Thyroxine to Glass and Plastic Containers[1]

John A. Kennedy, M.B., M.R.C.P.[2] and Gerald S. Besses, B.S.[3]

Glasgow, Scotland, and Philadelphia, Pa.

Previous studies have reported the adsorption of radioactive iodine-labeled compounds including ^{131}I-thyroxine, ^{131}I-triiodothyronine, ^{131}I-insulin, ^{131}I-albumin, ^{131}I-ribonuclease (1-6). It has also been reported that this adsorption can be prevented by the addition of small amounts of albumin or gelatin (2,3,6,7). Adsorption of labeled albumin to polyethylene, siliconized glass, stainless steel, and rubber and of labeled insulin to polyethylene and siliconized glass has been described (2,4).

The increasing laboratory use of plastic containers for such solutions led to this study which compares the adsorption of ^{131}I-thyroxine to glass with adsorption to various plastic containers. The prevention of adsorption of ^{131}I-thyroxine by the addition of 0.005%-0.01% albumin is discussed.

METHODS AND MATERIALS

Materials included iodine-131-thyroxine solution in 50% propylene glycol, specific activity approximately 30 mc/mg (Courtesy of Dr. Howard Glenn, Abbott Labs., Oak Ridge, Tennessee,)

Bovine albumin, Fraction V powder (Armour Pharmaceutical Co.),

29 × 105 mm centrifuge tubes—polyethylene, polypropylene, polycarbonate, cellulose nitrate and Pyrex glass, and

4 fl. oz. reagent bottles—Teflon, polyethylene and Pyrex glass.

The adsorption of ^{131}I-thyroxine to the walls of various laboratory containers was studied by an indirect method using the rate of disappearance of radioactivity from a solution of ^{131}I-thyroxine added to each vessel. Care was taken to insure uniform treatment of all containers before and during the study.

Polyethylene and Pyrex glass were used as both bottles and tubes so that Teflon, which was available in bottle form only, could be compared with the other plastics. The selected containers were of the same shape so that the surface area exposed to the isotope solution was uniform. Before use, the vessels were washed with a commercial laboratory detergent and rinsed with several changes of distilled water before hot air drying. Radioactive tubes were first washed in an albumin solution, which was found to remove all extraneous radioactivity.

---

[1]Supported by USPHS training grant TI-AM-5370.

[2]Royal Infirmary, Glasgow, Scotland.

[3]2012 Walnut St., Philadelphia, Pa.

An aqueous solution, pH 5.5, containing 0.1 uc/ml (10^{-12}M) ^{131}I-thyroxine was prepared. Duplicate 1.0 ml aliquots of this solution were withdrawn into 15 × 100 mm test tubes and 40 ml immediately transfered into each container under study. At timed intervals thereafter, similar 1.0 ml aliquots were withdrawn from each vessel into 15 × 100 mm test tubes for determination of radioactivity subsequent to the completion of all sampling. During this period, the containers and tubes were kept sealed in the refrigerator. Only minimal necessary handling of the specimens was allowed and no mixing or shaking was undertaken.

The test tubes were analyzed for radioactive content using a Baird Atomic well-type γ spectrometer. As counting for all samples was delayed to this stage, no correction for decay was necessary. Counting was carried out for one minute and all count rates were above 10,000 cpm. The count rates, expressed as a percentage of the count rate at 0 hours, were graphed as a function of time.

Aqueous solutions of ^{131}I-thyroxine with added albumin at a concentration of 0.1% to 0.001% were used in a similar manner.

RESULTS

A comparison of the adsorption activities found is shown (Fig. 1). The adsorption characteristics of Teflon and Pyrex are closely similar, Teflon showing less adsorption than the other plastics. Polyethylene shows considerably more adsorption than the other plastics.

Albumin at a concentration of 0.01% is effective in preventing adsorption

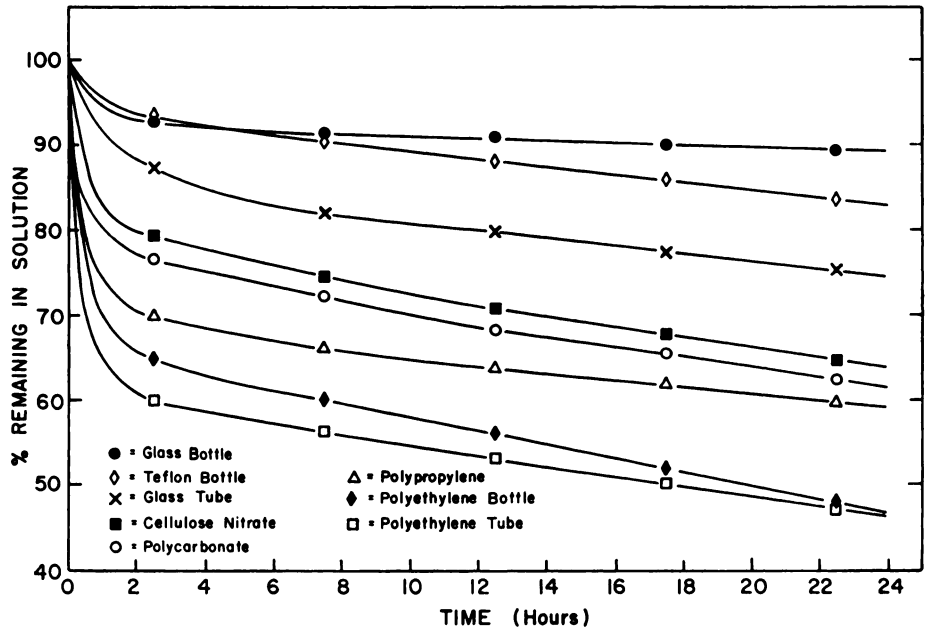

Fig. 1. Values are given as a per cent of ^{131}I remaining in solution of ^{131}I-thyroxine as determined by the activity of one-ml aliquots of the solution.

to all plastics tested. Adsorption to Pyrex was effectively prevented by 0.005% albumin (Fig. 2).

SUMMARY

Using an indirect method, a comparison of the adsorption of ^{131}I-thyroxine to glass and plastic laboratory containers has been made. The extent to which the container can influence the concentration of the dilute solutions of ^{131}I-thyroxine and the use of low concentrations of albumin to prevent this is shown. Pyrex glass is found to be most suitable for the storage of this compound.

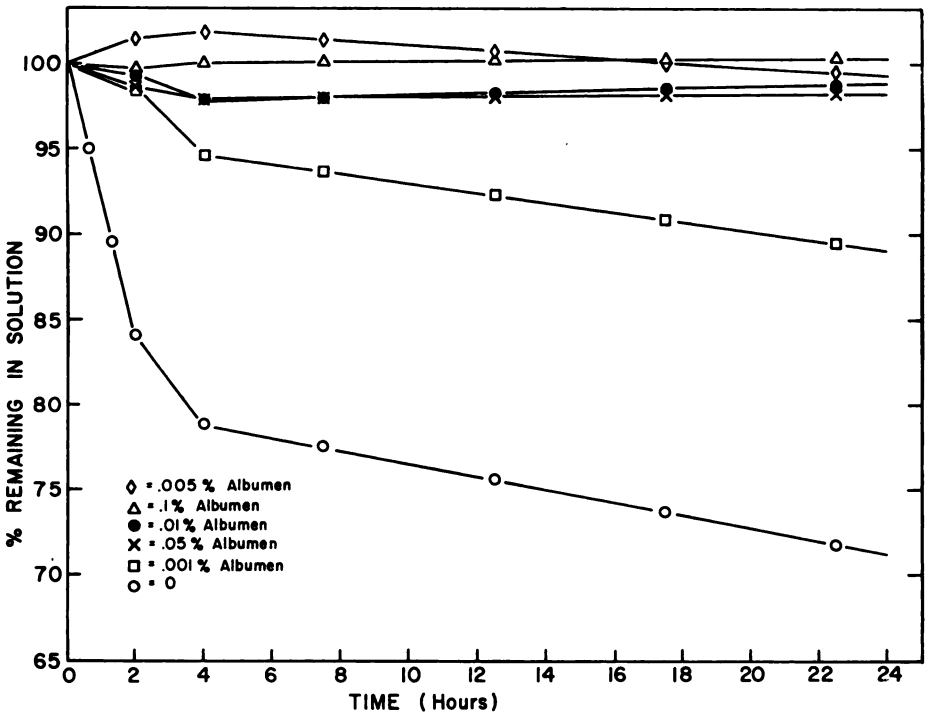

Fig. 2. Activity of one-ml aliquots was measured and values are expressed as a per cent of the original ^{131}I remaining in solution.

REFERENCES

1. Imarisio, J. J., and Greco, J.: Glass Binding of Labeled Thyroxine and Triiodothyronine. *Biochim. Biophys. Acta* **82**:172, 1964.

2. Hill, J. B.: The Adsorption of ^{131}I-Insulin to Glass. *Endocrinology* **65**:515, 1959.

3. Wiseman, R., and Baltz, B. E.: Prevention of Insulin-^{131}I Adsorption to Glass. *Endocrinology* **68**:354, 1961.

4. Reeve, E. B., and Franks, J. J.: Errors in Plasma Volume Measurement from Adsorption Losses of Albumin-^{131}I. *Proc. Soc. Exp. Biol. Med.* **93**:299, 1956.

5. Newerly, K., and Berson, S. A.: Lack of Specificity of Insulin-^{131}I-Binding by Isolated Rat Diaphragm. *Proc. Soc. Exp. Biol. Med.* **94**:751, 1957.

6. Lissitzky, S., Bénévent, M. T., and Roques, M.: Adsorption de la 3':5'-^{131}I-L-Thyroxine sur le verre et désiodation. *Compt. Rend. Soc. Biol.* **154**:142, 1960.

7. Lissitzky, S., Roques, M., and Bénévent, M. T.: Influence des protéines sur l'adsorption de la ^{131}I-L-thyroxine par le verre. *Compt. Rend. Soc. Biol.* **154**:396, 1960.