nm/ CONCISE COMMUNICATION

LOWER NORMAL VALUES FOR ^{131}I THYROID UPTAKE NOT RELATED TO THE INGESTION OF WHITE BREAD

Manfred Blum and Ramesh Chandra

New York University Medical Center, New York, New York

Several laboratories have recently reported a lowering of the fractional uptake of radioactive iodine by the normal human thyroid gland (*1,2*). This phenomenon has been attributed to an increase in dietary iodide, with white bread contributing as much as 150 mg of iodine per slice (*2*). This recent increase in the iodide content of bread is related to the introduction of a "continuous mix" baking process which requires the incorporation of various iodine-containing constituents into the dough. A major commercial bakery (*3*) reported that currently the amounts of iodide in bread were far lower than this figure. An average slice of white bread typical of the baking industry might now contain 37.5 mg of iodide per average 20-gm slice produced by the conventional baking process and 75 mg for the continuous mix bread.

Variation in the dietary intake of iodine is quickly reflected in the kinetics of iodine metabolism, and the fractional uptake of iodine by the thyroid gland is inversely related to such consumption (*4*). Therefore one must have timely accurate information concerning dietary iodide. We investigated the iodide content of white bread in the New York City area because we failed to find enhanced serum iodide concentrations and reduced ^{131}I uptake values in a number of patients who consumed four to six slices of white bread per day habitually. Nevertheless, our normal thyroid uptake values have fallen recently.

METHOD

Bread products were purchased from grocery stores at four separate times over a period of six months in various parts of New York City. The iodine content of six popular brands of sliced white bread was studied. A slice from each loaf was dried at room temperature for 24–48 hr in a Boekel dessicator containing dehydrated silicate gel dessicant until consecutive weights were constant. Each sample was ground and homogenized. Precautions were taken to minimize iodine loss during this preparation, and duplicate samples were shipped in tight plastic containers to Bio-Science Laboratories where iodine was assayed by a modification of the method of Barker et al (*5*).

Thyroid uptake was measured 2, 4, and 24 hr after ^{131}I was ingested using a Picker Nuclear Omniprobe thyroid uptake system. The neck-to-crystal distance was 30 cm and a Lucite phantom containing a radioiodine source in 30-ml solution was used as a standard. A thigh background subtraction was used at each observation time to correct for radioiodine in the extrathyroidal space of the neck.

One hundred thirty-two patients were evaluated for thyroid ^{131}I uptake between June and December 1970. Accurate followup data are available in 101 subjects. Of these, 69 were euthyroid by clinical criteria; they did not have thyroid enlargement, and they had serum thyroxine concentrations that were within the normal range.

RESULTS

The iodine content per slice from six different brands of popular commercially available white bread is shown in Table 1. A maximum of 32.4 mg per slice was found. Values varied in that brand to less than 1 mg per slice. Another major brand had similar heterogeneity of iodide content from 1 mg to almost 18 mg per slice. Generally the white bread contained 6 mg or less of iodide per slice.

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For reprints contact: Ramesh Chandra, Div. of Nuclear Medicine, University Hospital, New York University Medical Center, 560 First Ave., New York, N.Y. 10016.

TABLE 1. IODINE CONTENT PER AVERAGE SLICE OF WHITE BREAD IN NEW YORK CITY AT SPECIFIED TIMES DURING 1970 (mg/slice)*

Date sampled	Bread I	Bread II	Bread III	Bread IV	Bread V	Bread VI
5/1/70	1.20	0.88	1.85	—	—	—
6/19/70	1.02	—	2.40	0.32	—	—
9/13/70	1.09	32.4	—	—	5.6	2.04
10/10/70	18.0	30.0	0.98	—	—	—

* Assayed by Bio-Science Laboratories, Van Nuys, California.

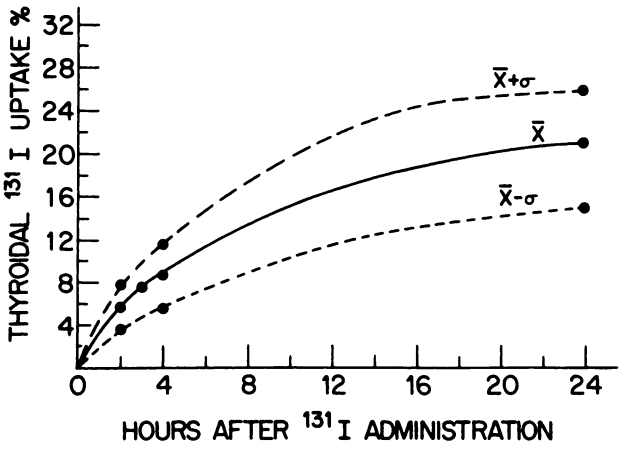

FIG. 1. Average thyroid ^{131}I uptake in 69 euthyroid subjects as function of time. $\bar{X}$ and σ represent mean and 1 s.d., respectively.

The ^{131}I uptake for normals was last calculated in this laboratory in 1963. The range was 20–45%. The method of performing the uptake determination has not changed since then. Nevertheless, the values are now distinctly lower. The progression of the percent uptake of ^{131}I by the thyroid gland in 69 euthyroid individuals who are otherwise healthy is 6 ± 2 at 2 hr, 8 ± 3 at 4 hr, and 21.5 ± 6 (1 s.d.) at 24 hr shown in Fig. 1. Our present normal range is 10–34% at 24 hr, considering 2 s.d. from the mean.

DISCUSSION

A distinct reduction in the normal range of ^{131}I uptake has been reported in several laboratories. These observations are also true in our laboratory where the normal range for the 24-hr ^{131}I uptake has changed from 20–45% in 1963 to 10–34% in 1970. Inquiries into the cause of such reduction lead to extensive interrogation about the dietary and drug history of our patients. It has been our practice to obtain detailed information from patients concerning their intake of bread. We did not find an inverse relation between ^{131}I uptake and bread consumption in euthyroid patients. Therefore, samples of six major commercial white breads were obtained in random fashion at four different times during a 6-month period in 1970 in various parts of this city and then were submitted for iodide analysis. The values that we obtained are far smaller than those reported in the recent literature (*1*). We found no more than 32.4 mg per slice. It is most unikely that these results are spuriously low due to loss of iodide in preparation or transit of the samples.

The clearance of iodide from the blood and its incorporation by the normal thyroid gland for thyroid hormone synthesis is inversely related to the average daily ingestion of iodide (*4*). Enhanced daily intake results from diets rich in ocean products and in foods containing iodinated additives.

Distinctly high intake may be found in some parts of the world. Iodine-containing contrast agents and the administration of iodinated drugs also enlarge the iodide pool. The opposite pertains in large parts of the world where the diet is deprived of iodide because this mineral is deficient in food stuffs and there is no dietary supplementation. In certain disease states there may be iodide lack due to loss in the urine from diuresis or the elimination of salt (which is now usually iodinated) from the diet. The average daily dietary iodide intake is about 150 mg per day. Enriching the diet to 300 mg per day of iodide has been shown to significantly lower ^{131}I uptake in 2-year-old children within 2 weeks (*6*). Larger daily amounts of iodide caused further suppression of uptake (*7*). Immediate, almost complete inhibition of radioiodine incorporation by the adult thyroid can be caused by the administration of 100–200 mg of potassium iodide. The high iodide content of white bread (150 micrograms per slice) reported by Pittman et al could contribute large quantities of iodine to the diet and reduce thyroid iodide uptake in individuals who are accustomed to consume sandwiches and additional quantities of bread at meals. However, as these authors caution, the iodide content of bread could change abruptly with the substitution of noniodine-containing ingredients for iodates in bread (*8*). This appears to be the case according to a communication from the Director of Laboratories of a major commercial bakery and the results

of this investigation. The consumption of reasonably large quantities of white bread containing the amounts of iodide reported here is not likely to enhance dietary iodide greatly and would not affect thyroid uptake appreciably.

The extensive variation in iodide content even within one brand of bread during a relatively short time span is noteworthy. Indeed, it is possible that even greater variation exists. Since the uptake of radioiodine by the thyroid gland is a commonly used indicator of thyroid function and is extremely sensitive to dietary iodide, precise timely information concerning the dietary iodide experience of patients is an absolute requirement. One cannot assign accurate normal values to this test without such information.

The observed fall in ^{131}I uptake in our laboratory cannot be attributed to enhanced iodide in white bread. Its cause is not elucidated by this study. Unfortunately, we were unable to routinely measure urinary iodide in these patients and therefore have no data on their iodine burdens related to other intake.

SUMMARY

Analysis of white bread in the New York City area reveals an iodine content appreciably less than previously reported from another part of the country. The lower normal values for thyroid uptake which are now generally reported may be related to other causes.

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