NEW NORMAL RANGES FOR THE RADIOIODINE UPTAKE STUDY

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For some time we have observed a lack of correlation between the radioiodine uptake tests and the clinical status of the patient. The need for reevaluation of our normal ranges was suggested by the comments heard at the Society of Nuclear Medicine meeting in June 1969 and by the publication of Pittman *et al* (*1*). A prospective study was devised to determine current, valid, normal ranges for our geographic area *with our equipment.*

MATERIALS AND METHODS

Our objective was to study unmedicated euthyroid subjects in equilibrium with their iodine diet rather than hospitalized patients with thyroid disease and/or other diseases. Fasting subjects reported to the Nuclear Medicine Department between 8 am and 9 am. The patient completed a questionnaire designed to reveal the presence of thyroid or other disease, iodine contamination or ingestion of drugs known to affect thyroid handling of iodine. The completed questionnaire was reviewed, and if the subject fulfilled the above requirements for the test, blood was drawn for a T_4 test by column, a PBI and a T_3 uptake test. The patient was then given a 30–70 μCi dose of ^{131}I in capsule form. Using a Picker Hemoliter attached to an external detector system, the thyroid uptake of iodine was measured at 6 and 24 hr. The external detector consisted of a 1¼ x 1 in. NaI(Tl) scintillation crystal and a flat-field lead collimator. A Lucite extension of the collimator was shaped to fit the neck and assure good geometry with a neck-to-crystal distance of 20 cm. A standard neck phantom was used with standard capsules containing doses identical to those given to the subjects.

RESULTS

There was a remarkable difference between the traditional normal range and the range found in our normal subjects. The distribution of the 6- and 24-hr uptakes for 116 normal subjects is shown in Figs. 1 and 2. The studies of nine subjects were excluded because of abnormal blood-test results or the subject's failure to appear for the 6- or 24-hr neck count. The age range was 17–65, and there were 96 females and

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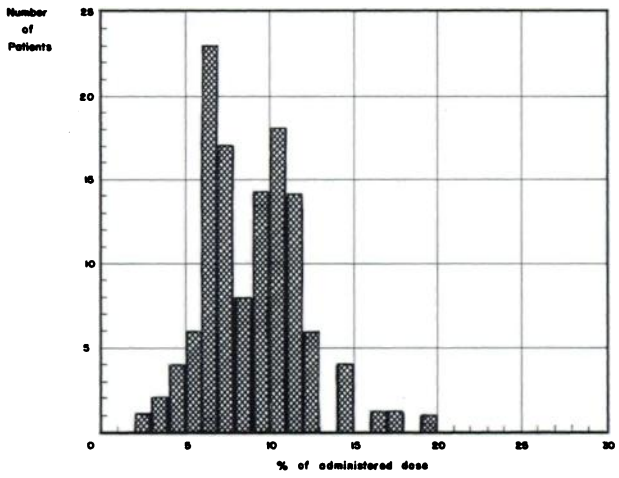

FIG. 1. Distribution of 6-hr uptakes in 116 normals.

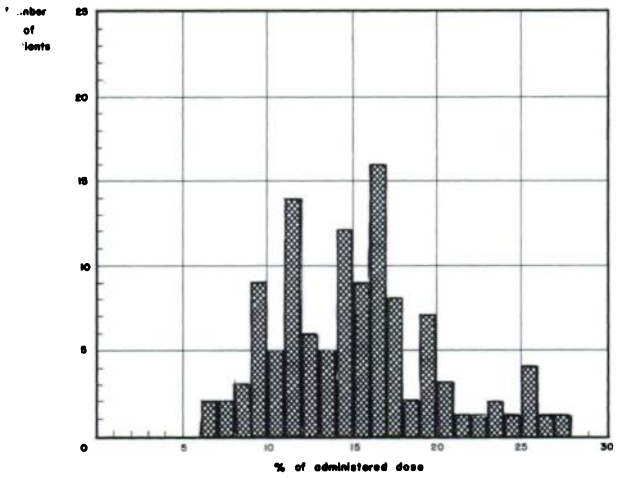

FIG. 2. Distribution of 24-hr uptakes in 116 normals.

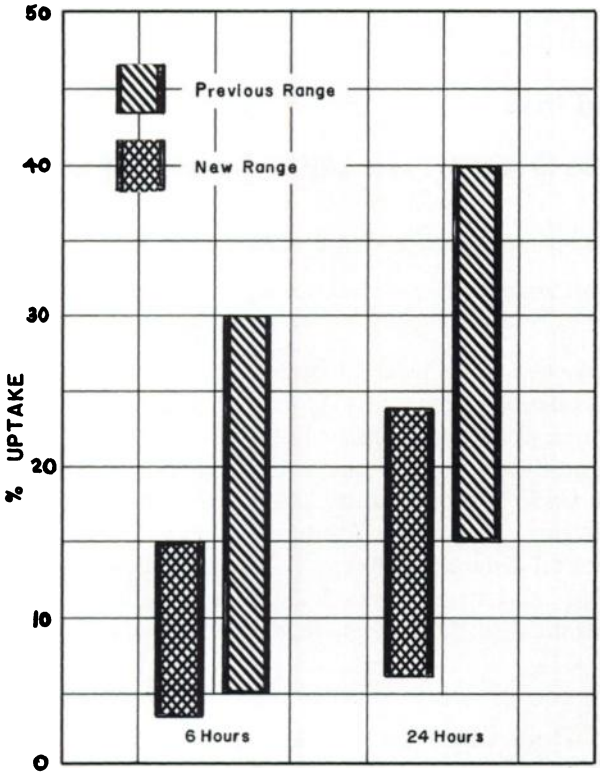

FIG. 3. Comparison of radioiodine uptake normal values.

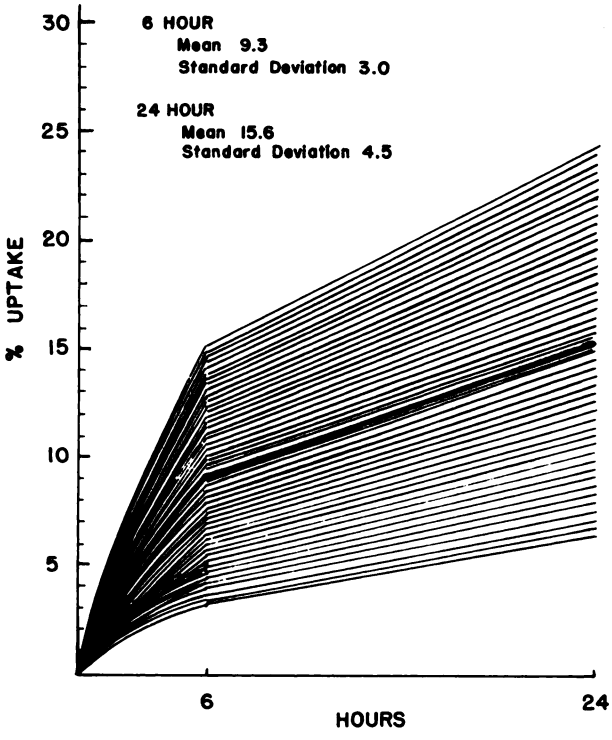

FIG. 4. Mean ±2 s.d. for 6- and 24-hr uptake values.

20 males. The mean PBI was 6.37 μg/100 ml (normal range 4–8), the mean T_4 was 4.94 μg/100 ml (normal range 3.0–6.4) and the mean T_3 uptake was 28.2% (normal range 25–35%). Forty-one of the subjects were taking estrogen. Where this applied, the PBI and T_4 were high normal and the T_3 uptake was low normal or low. No relation of radioiodine uptake to estrogen ingestion was noted. Comparison of old and new ranges (Fig. 3) reveals the marked difference and is in agreement with the studies done by Pittman *et al* for subjects in Birmingham, Alabama (*1*). The mean 6- and 24-hr uptake values plus or minus 2 standard deviations (Fig. 4) provided the data for establishing current normal ranges (Table 1).

DISCUSSION

Wide ranges for normal radioiodine uptake values make it incumbent upon the laboratory to establish a normal for the geographic area (*2*). Extremes for high ranges (*3*) and low ranges (*4,5*) in various areas attest to the importance of this basic concept of good intralaboratory quality control. The greatest pitfall in the iodine uptake test is the ubiquitous iodine atom obtained from multiple sources in man's everyday environment. Even our daily staple, bread, has been accused of causing a marked lowering of current uptake values. That this is entirely possible has been amply demonstrated by Pittman *et al* (*1*). Use of standard methods has been emphasized repeatedly, but uniformity has been difficult to obtain. The existence of several varieties of uptake apparatus has complicated matters. These aspects of the problem make even more important the establishment of a set of local normal values and the inclusion of the normal ranges for that particular laboratory with the patient's report (*6*).

SUMMARY

Normal iodine uptake ranges in our laboratory have definitely changed over the past 15–20 years, at least partly due to variations in iodine exposure

TABLE 1. NORMAL RANGES FOR RADIOACTIVE IODINE UPTAKE IN STOCKTON, CALIFORNIA, 1969

	Uptakes at	
	6 hr	24 hr
Hypothyroid	0– 3%	0– 5%
Borderline low	4– 7%	6–10%
Euthyroid	8–15%	11–25%
Borderline high	16–25%	26–30%
Hyperthyroid	over 25%	over 30%

of the population. In addition, basic and commonsense concepts of intralaboratory quality control make it mandatory that all laboratories establish normal ranges for the iodine uptake study. A prospective study in Stockton, California, revealed normal ranges vastly different from those used previously. They are very comparable to modern normal ranges recently established in Birmingham, Alabama. Normal ranges must be reestablished as necessary with the passage of time and changes of equipment. Normal subjects must be used for this purpose, not patients suspected of having thyroid or other serious disease.

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