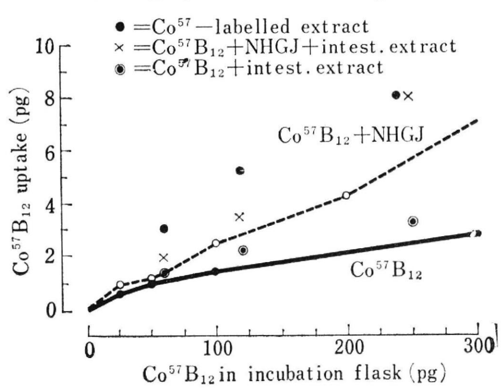
releasing factor", another attempt was further made to decide in which form (free or bound?) B_{12} exists in intestinal mucosa. For this purpose, intestinal extracts of ^{57}Co-B_{12} was prepared from guinea pig ileum 1 or 3 hours after tube feeding of Co^{57}-B_{12}-NHGJ mixture, the detail of which is described elsewhere[8][9]. Gel filtration of the extracts through Sephadex G-25 resulted in the appearance of two peaks of B_{12} radioactivity, the first being B_{12} bound to substances with a molecular weight of more than 4000 and constituting the sharp high peak, and the second being free B_{12} small peak. (Fig. 1) Free ^{57}Co-B_{12} appeared in the second peak was the same in amount as ^{58}Co-B_{12} released at the in vitro stage of the experiment from NHGJ, thus suggesting that the releasing factor does not exert its effect in vivo state or may not be present in vivo. At any rate, the results of this experiment point to a possibility that IF may also be absorbed into the intestinal mucosa at the time of B_{12} absorption and B_{12} exist in the mucosa as bound B_{12} with a molecular weight of more than 4000.

7) In the next step of the investigation, it is imperative for this bound B_{12} to be tested for IF activity. With this in mind, the bound B_{12} was assayed for IF activity by a modified method of in vitro IF assay reported by Sullivan et al.[10] As a result, the bound B_{12} showed a definite effect on the stimulation of B_{12} uptake by guinea pig intestinal homogenates. This indicates that the bound B_{12} has an IF-like activity[9]. (Fig. 2). Furthermore, in conformity with the result of the afore-mentioned immunologic study of hog IF, this fact more strongly suggests the possibility that IF may also be absorbed when B_{12} is absorbed from intestine. Nevertheless, as to the fate of B_{12} or IF after absorption, no evidence was obtained from the present study, and therefore further studies are required before the conclusions are drawn.

Effect of intestinal extract on uptake of Co^{57} B_{12} by intestinal homogenate



References

(1) Castle, W.B., and Townsend, W.G., Am. J. Med. Sci., 178: 764, 1920.
(2) Ukyo, S., J. Vitaminol., 8: 41, 1962.
(3) Inada, M., to be published.
(4) Morishita, R., to be published.
(5) Wakisaka, G., Uchino, H., Ukyo, S., et al., Naika, 6:, 12, 1960.
(6) Herbert, V., and Castle, W.B., New Engl. J. Med., 270:, 1181, 1964.
(7) Ukyo, S., Saishin Igaku, in print, 1965.
(8) Cooper, B.A., and Ukyo, S., Clin. Res., 12:, 222, 1964.
(9) Ukyo, S., and Cooper, B.A., Am. J. Physiol., 208:, 9, 1965.
(10) Sullivan, L.W., Herbert, V., and Castle, W.B., J. Clin. Invest., 42:, 1443, 1963.

Statistical Studies on Treatment of Hyperthyroidism with ^{131}I in Japan

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In 1965, statistical studies were made of 3,666 cases of hyperthyroidiism treated with ^{131}I in 19 university hospitals in Japan (males 21.4%, females 78.6%): 98.9% diffuse and 1.1% nodular goiters.

The average number of treatments was 1.4, and the mean total dose of ^{131}I was 7.6 mC. The results of this treatment were excellent in 73.3% of the cases, improved in 17.5% and unchanged in 4.5%, hypothyroidism developed in 3.5%. Follow-up results showed a rate of cure of 62% 6 months after treatment, which increased gradually thereafter. After 7 years excellent results were seen in over 85% of the cases. The incidence of hypothyroidism was 3-4% during the first 6 years following treatment, but 5.8% after 7 years and 8.2% after 8 years. Various side effects were noted in 5.9% of the patients: headache, fever, circulatory disturbances, gastrointestinal disturbances, depilation, hemorrhage, skin rash, transient leukopenia and dysphagia. There were 2 cases of acute myelogenous leukemia, 2 of anemia and 4 of non-toxic nodular goiter following ^{131}I treatment.

The first dose of ^{131}I averaged 6.3 mC. After the first treatment 47.1% were cured, 34.1% improved, 14.8% unchanged, and 3.6% suffered from temporary hypothyroidism. The effectiveness of the first treatment was analyezed in relation to various factors, and some correlation was found with 16 factors: sex and type of goiter, age, presence or absence of complications, of previous treatment, or of exophthalmos, duration of disease, thyroid weight, thyroid ^{131}I uptake, effective half life (EHL), BMR, severity of hyperthyroidism, dose of ^{131}I, dose of ^{131}I per gram of thyroid, irradiation dose to thyroid, side effects and effect of the treatment. In 441 cases in which all of these factors were recorded, the partial correlation coefficients between every 2 factors were calculated. From the studies of this partial correlation matrix, it could be presumed that the important factors related to the effectiveness of treatment were age, presence or absence of previous treatment, or of exophthalmos, thyroid weight, BMR, thyroid ^{131}I uptake and EHL. To derive the formulas for estimating the dose of ^{131}I, a regression analysis was performed with these 7 factors in 196 cured cases selected from the 441 cases.

Model I: Formula for calculation of dose of ^{131}I derived from 5 factors (age, presence or absence of previous treatment, or of exophthalmos, thyroid weight and BMR)

$$Y=0.412x_4^{0.565}\quad EXP(\sum_{\substack{i=1\\i\neq 4}}^{5}\beta_i x_i)$$

Model II: Formula for calculation of dose of ^{131}I derived from 6 factors (age, presence or absence of previous treatment, or of exophthalmos, thyroid weight, BMR and thyroid ^{131}I uptake)

$$Y=0.437x_4^{0.563}\quad EXP(\sum_{\substack{i=1\\i\neq 4}}^{6}\beta_i x_i)$$

Model III: Formula for calculation of dose of ^{131}I derived from 7 factors (age, presence or absence of previous treatment, or of exophthalmos, thyroid weight, BMR, thyroid ^{131}I uptake and EHL)

$$Y=0.560x_4^{0.564}\quad EXP(\sum_{\substack{i=1\\i\neq 4}}^{7}\beta_i x_i)$$

Y is the calculated dose of ^{131}I.

β_i is a constant with the following values,

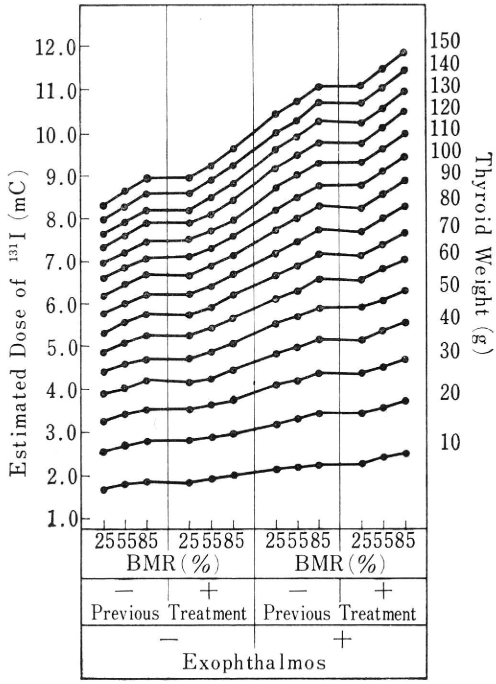
	Model I	Model II	Model III
β_1	0.03657	0.03675	0.03929
β_2	0.004671	0.004687	0.004831
β_3	0.1184	0.1177	0.1084
β_5	0.1160	0.001130	0.001069
β_6		−0.001046	−0.0007813
β_7			−0.04182

x_i is represented by the number below.

x_1:	absence of previous treatment	0
	antithyroid drug treatment	2
	partial resection	3
	antithyroid drug treatment + partial resection	4
	other treatments	1
x_2:	age in years	
x_3:	absence of exophthalmos	0
	mild exophthalmos	1
	severe exophthalmos	2
x_4:	thyroid weight (g)	
x_5:	BMR (%)	
x_6:	thyroid ^{131}I uptake (%)	
x_7:	EHL (days)	

Of the cases treated with the dose of ^{131}I calculated from Model I, 50% were cured, 34% improved and 15% unchanged. Thus, excellent results can be expected in 50% of cases after the first treatment, if the dose of ^{131}I is calculated from Model I. Calculations according to Model II, III would give almost the same results.

Figure shows the calculation of a dose of ^{131}I from Model I for a 35 year old patient. In Model I, thyroid ^{131}I uptake is not a factor, but the average thyroid ^{131}I uptake in the cases used to derive Model I was 65.5%. Therefore, when we use Model I, we must be sure that the thyroid ^{131}I uptake of the patient is between 60 and 70%.



Use of Whole Body Counters in Medical Diagnosis

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Recently, whole body counters have been widely used in nuclear medicine. The main uses can be divided into the following two categories: (1) determination of total potassium in the human body using ^{40}K activity and (2) metabolic studies following the administration of radionuclides such as ^{22}Na, ^{42}K, ^{59}Fe, and ^{85}Sr etc. which are distributed throughout the whole body.

Judging from these applications, whole body counters to be employed in medical diagnosis should be designed differently from those used in health physics studies. Moreover, these counters may have very different features for the two categories mentioned above.

We have built two types of whole body counters at National Institute of Radiological Sciences. The one that is mainly used for ^{40}K measurement is made of eight units of large volume plastic scintillators* (50 × 50 × 15 cm rectangular shape), each of which is viewed by four 5 in. diameter photomulti pliers. The counting geometry is as follows: four units are placed above a bed on which a subject lies and another four are positioned under the bed. So, the four units form a 200 cm (length) × 50 cm (width) × 15 cm (thickness) scintillator block, and distance between the two blocks is 40 cm. The whole units are shielded an iron cubicle of 15 cm thickness. Detection efficiency of this counter is such that ^{40}K activity in an adult male (about 120 g of potassium) can be determined with the statistical accuracy of ±1.5% for 15 min. counting time of subject and back-

* supplied by Matsushita Electric Co., Japan