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Effect of Potassium Iodide and Thyroid Extract on Thyroid Gland of Guinea-Pig.*

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In a series of investigations on the compensatory hypertrophy of the thyroid gland in guinea pigs, it was found that within the normal gland there was discernible a formation of three layers which differed in (1) the size of acini, (2) the more or less solid state of the colloid, (3) the quantity of this substance and (4) the height or flatness of the epithelium lining the acini. There is usually associated with a greater hardness and a greater quantity of the colloid a greater flatness of the epithelium.[1] This suggested that the character of the epithelium lining the acini may be determined, at least in part, by the condition of the colloid, and in particular by the presence or absence of pressure exerted upon the epithelium by this substance, and by surrounding acini. There was some apparent confirmation of this view in the further observation that, not rarely, the walls separating neighboring acini may be broken through, and that such a change may be followed by the union of the colloid material of both acini. This fact also suggested a pressure effect.

It has been observed by Marine and Lenhart[2] that in certain kinds of goitre, administration of potassium iodide may cause an increase in the amount of colloid of the acini, and reduce the height of the epithelium. More recently several authors have found that in exophthalmic goitre potassium iodide may at least temporarily lead to a reduction in size of the epithelium lining the acini. On the other hand, it has been observed that under certain conditions administration of this substance may intensify the symptoms of abnormal thyroid activity, and in our series, referred to above, it was shown that contrary to current opinion, feeding of potassium iodide to guinea pigs, from which great parts of their thyroid gland had been removed, did not diminish the subsequent compensatory hypertrophy of this organ, but that, on the contrary, in our rather extensive series, it seemed definitely to increase the size of the cells, the number of mitoses, as well as the fluidity and absorption of the col-

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loid. These facts suggested that under certain conditions potassium iodide may exert a stimulating effect on the thyroid.

On the other hand, we found that feeding of thyroid substance prevents compensatory hypertrophy; it makes the colloid more solid, the epithelium lower, and diminishes the number of mitoses, and in certain cases it seems even to cause a decrease in the size of the acini and of the gland. Feeding with anterior pituitary extract has a somewhat similar effect to that produced by thyroid extract, although this effect was less pronounced.[1]

In order to contribute, if possible, to an explanation of this apparently contradictory evidence, we decided to investigate the effect of feeding potassium iodide and thyroid substance on the structure of the normal thyroid gland in guinea pigs. Our main observations are as follows: Feeding potassium iodide to normal guinea pigs does not lead to a marked diminution in the size of the acinus cells within the first 30 days. If there is possibly some diminution in some cases, there are, on the other hand, other cases in which the acinar cells are at least as large as the average cells in the controls or even larger. From about 40 days on, following the feeding with KI, the epithelium becomes lower and gradually the acini enlarge. The colloid now is solid and hard. Mitotic activity of the acinar epithelium is decidedly increased during the first 6 weeks following administration of KI. In a number of cases, mitoses were very numerous in the acinar epithelium of the KI fed animals. On the other hand, the acinar epithelium of the thyroid fed guinea pigs is on the whole relatively low, the colloid is solid, and the number of mitoses is smaller than even in the control series.

It seems to us that it may, perhaps, be possible to reconcile the apparently contradictory evidence as to the effects of potassium iodide and thyroid substance on the thyroid gland by assuming that administration of iodide stimulates the thyroid gland to increased activity, as evidenced by the increased number of mitoses. However, under these circumstances the colloid produced does not leave the acini in a sufficient quantity; it remains largely stored in the gland, and thus it may gradually exert an injurious pressure on the acinar walls, and in particular on the epithelium lining the latter. As the result of these injurious changes, perhaps in association with some other factors, the activity of the gland is gradually inhibited. However, if we set into motion a mechanism which causes the rapid solution of the colloid, and its removal into the vascular system, these secondary injurious influences may be prevented. This may be accomplished through removal of great parts of the thyroid gland

and thus we often find in compensatory hypertrophy of the thyroid gland an increased activity under the influence of potassium iodide. There may be, in addition, still other factors involved in the action of this substance on the thyroid gland. In the case of thyroid feeding, an excess of thyroxin in the circulation prevents the mobilization of colloid in the gland, which remains thus solid, and in addition the thyroxin may perhaps gradually cause an atrophy of the epithelium, as an expression of the inactivity of the gland produced by the excess of the hormone.

[1] Loeb, Leo, *J. Med. Res.*, 1919, xl, 199; 1920, xli, 481; 1920, xli, 77; *Am. J. Path.*, 1926, ii, 19. Loeb, Leo, and Hesselberg, Cora, *J. Med. Res.*, 1919, xl, 265. Loeb, Leo, and Kaplan, E. E., *J. Med. Res.*, 1924, liv, 557.

[2] Marine, David, and Lenhart, C. H., *Arch. Int. Med.*, 1909, iv, 253.