STUDIES ON THE EFFECT OF THYROID AND METHYLTHIOURACIL ON THE GLUCOSE TOLERANCE TEST IN NORMAL AND SCORBUTIC GUINEA PIGS

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Patients with hyperthyroidism often have high fasting blood sugar levels and glucose tolerance curves of a diabetic type. These become normal after thyroidectomy (1-7). The glycogen content of the liver of rats is decreased when experimental hyperthyroidism is produced (8). Prina (9) has shown that intraperitoneal injection of thiouracil causes a definite increase in the glycogen content of the liver of guinea pigs. Sure and Theis (10) have reported that if a toxic dose of thyroxine is fed to rats the vitamin C content of the adrenal, thymus, and kidney is greatly reduced. Demole and Ippen have observed (11) that the loss in weight of guinea pigs after injection of thyroxine can be prevented by increasing the dose of vitamin C. A large dose of ascorbic acid promotes the general vitality and improves the appearance of guinea pigs on a thyroid diet (12). Monetti (13) has observed that administration of a non-toxic dose of thyroxine enhances the course of scurvy in animals on the same diet without the hormone. Lewis (14) has reported that in thyrotoxic patients the excretion of vitamin C is below normal and becomes normal after thyroidectomy. It has been observed by us (15) that scorbutic guinea pigs show a diminished glucose tolerance, diminished glycogen content of the liver, and diminished insulin content of the pancreas. It was therefore of interest to ascertain whether or not the metabolism of the thyroid gland is also interfered with during the development of scurvy. In the present paper studies of the effects of feeding desiccated thyroid gland and methylthiouracil on the glucose tolerance of both normal and scorbutic guinea pigs are presented.

EXPERIMENTAL

Healthy, male, growing guinea pigs, varying between 300 and 380 gm. in weight, were fed six different diets for a period of 3 weeks. The diets were (1) the scorbutic diet only (16); (2) the scorbutic diet containing 1 per cent methylthiouracil; (3) the scorbutic diet with 0.05 per cent desiccated thyroid; (4) the scorbutic diet with a daily supplement of 5 mg. of ascorbic acid per animal; (5) the scorbutic diet with methylthiouracil and a daily

1 Desiccated thyroid tablets, Parke, Davis and Company, were used. 0.05 per cent refers to desiccated thyroid gland.
supplement of vitamin C; and (6) the scorbutic diet with thyroid and a daily supplement of vitamin C. The oral test for glucose tolerance was performed on the 22nd day in all the animals according to the method described previously (17). The results are given in Table I.

**Table I**

*Glucose Tolerance Test in Guinea Pigs on Different Diets*

The results are given in mg. per cent.

<table>
<thead>
<tr>
<th>Diets fed*</th>
<th>Fasting blood sugar</th>
<th>Blood sugar after feeding glucose</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>45 min.</td>
<td>90 min.</td>
</tr>
<tr>
<td>Scorbatic diet only (8)</td>
<td>150 ± 8.2</td>
<td>226 ± 9.8</td>
</tr>
<tr>
<td>&quot; + methyl-thiouracil (8)</td>
<td>151 ± 10.7</td>
<td>298 ± 23.5</td>
</tr>
<tr>
<td>Scorbatic + thyroid (8)</td>
<td>151 ± 5.3</td>
<td>331 ± 3.4</td>
</tr>
<tr>
<td>&quot; + vitamin C (8)</td>
<td>122 ± 4.5</td>
<td>279 ± 11.7</td>
</tr>
<tr>
<td>Scorbatic + vitamin C and methylthiouracil (7)</td>
<td>121 ± 5.7</td>
<td>261 ± 10.8</td>
</tr>
<tr>
<td>Scorbatic + vitamin C and thyroid (8)</td>
<td>147 ± 5.5</td>
<td>271 ± 10.5</td>
</tr>
</tbody>
</table>

* The figures in the parentheses indicate the number of animals in the group.

**SUMMARY**

1. The types of glucose tolerance curves for each of the three groups of guinea pigs which received the scorbutic diet, the scorbutic diet with methylthiouracil, and the scorbutic diet with thyroid were more or less similar. This indicated that the deficient utilization of glucose observed in animals on the scorbutic diet only was not affected by either hypo- or hyperthyroidism.

2. The blood sugar level, 3 hours after feeding glucose to guinea pigs receiving thyroid gland and vitamin C, was significantly higher than that of the control animals receiving no thyroid gland. This indicated that hyperthyroidism lowers the carbohydrate tolerance in guinea pigs.

3. Methylthiouracil, however, had no effect on the glucose tolerance test, which showed that carbohydrate tolerance is not altered in hypothyroid guinea pigs.

4. The altered carbohydrate metabolism observed in scorbutic guinea pigs is, therefore, not due to either hypo- or hyperthyroidism.

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