THE EFFECT OF ADRENALECTOMY, ADRENAL CORTEX EXTRACT, AND ADRENAL CORTEX EXTRACT PLUS TESTOSTERONE PROPIONATE ON THE PHOSPHATASES OF RAT TISSUES*

Sirs:

Certain of the C₁₁ oxygenated adrenal cortical hormones cause glyco- 
oneogenesis from protein.¹ On the other hand, certain androgens stimu- 
late protein anabolism.² It seemed, therefore, that the simultaneous ad- 
ministration of these steroids would provide information concerning their 
mode of action in the body. As one means to this end, the "alkaline" and 
"acid" phosphatases of the liver and kidney were studied. It was assumed 
that the adrenal cortex influenced these enzymes to bring about its effect 
on carbohydrate metabolism.³

Male white rats weighing 140 to 240 gm. were used (see the table). 
The animals were given 1 per cent sodium chloride solution for drinking 
water. The testosterone propionate⁴ injections were begun on the 1st day 
after the operations, on the 4th day the food was removed, and on the 
5th day the adrenal cortex extract⁵ was injected.⁶ 1 to 2 hours after the 
last injection, the rats were anesthetized with sodium amytal. The tissues 
were removed and homogenized.⁷

The enzymes were determined as previously described⁷ except that the 
"acid" phosphatase was determined at pH 5.4.

The increase in "alkaline" phosphatase of the liver, as a result of ad- 
renalectomy and especially injections of adrenal cortex extract, indicates 
that the effect of the adrenal cortex on carbohydrate metabolism is by way 
of the phosphorylated intermediates. Apparently, the "acid" phospha- 
tase of the liver is not involved in the above processes. The situation in 
the kidney, however, is entirely different. In this organ adrenalectomy 
has no effect on the "alkaline" phosphatase but decreases the "acid" phos- 
phatase which is restored to, but not greater than, normal on the adminis- 
tration of adrenal cortex extract.

* This investigation was aided by a grant from the Josiah Macy, Jr., Foundation.
¹ Long, C. N. H., Katzin, B., and Fry, E. G., Endocrinology; 26, 309 (1940).
³ Cori, C. F., in A symposium on respiratory enzymes, Madison, 175 (1942).
⁴ Ciba Pharmaceutical Products, Inc., provided the testosterone propionate 
(perandren).
⁵ Dr. M. H. Kuizenga, The Upjohn Company, provided the adrenal cortex extract.
The inability of testosterone propionate to influence the effect of the adrenal cortex extract on the "alkaline" phosphatase of the liver or the "acid" phosphatase of the kidney indicates that under the conditions of the experiment there is no competition by the two types (protein anabolic and protein catabolic) of hormones for the intermediary products.

**Effect of Adrenalectomy, Adrenal Cortex Extract, and Adrenal Cortex Extract Plus Testosterone Propionate on Phosphatases of Rat Tissues**

<table>
<thead>
<tr>
<th>Group</th>
<th>No. of rats</th>
<th>Average body weight (gm)</th>
<th>Liver phosphatase</th>
<th>Kidney phosphatase</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>&quot;Alkaline&quot;</td>
<td>&quot;Acid&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>per gm.</td>
<td>per cent</td>
</tr>
<tr>
<td>Normal</td>
<td>6</td>
<td>216</td>
<td>3.6</td>
<td>+27</td>
</tr>
<tr>
<td>Adrenalectomized</td>
<td>8</td>
<td>204</td>
<td>4.6</td>
<td>+27</td>
</tr>
<tr>
<td>Adrenalectomized + C. E.*</td>
<td>8</td>
<td>151</td>
<td>16.8</td>
<td>+366</td>
</tr>
<tr>
<td>Adrenalectomized + C. E. + T. P.†</td>
<td>8</td>
<td>163</td>
<td>16.7</td>
<td>+364</td>
</tr>
</tbody>
</table>

* 1 cc. of adrenal cortex extract (aqueous, Upjohn) every hour for 8 hours on the 5th day after adrenalectomy.
† 2.5 mg. of testosterone propionate twice a day.

The increase in "alkaline" phosphatase in the kidneys of the rats receiving testosterone propionate probably is due to the androgen per se. Similar results have been obtained in rats that have received only testosterone propionate (Kochakian, unpublished).

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