URINARY EXCRETION OF 17-KETOSTEROIDS IN SCURVY

BY SACHCHIDANANDA BANERJEE AND CHANDICHARAN DEB

(From the Department of Physiology, Presidency College, Calcutta, India)

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Cholesterol and ascorbic acid of adrenals are significantly diminished in scorbutic guinea pigs (1). As these substances appear to be related to the formation of adrenal cortical hormone (2), it has been indicated that the secretion of this hormone might diminish in scurvy. The urinary excretion of 17-ketosteroids in females is said to depend almost entirely on the activity of the adrenal cortex. In Addison's disease in women the urinary excretion of 17-ketosteroids either becomes nil or is decreased to approximately one-third of the normal excretion (3). In the absence of adrenals in monkeys 17-ketosteroids excretion is also markedly reduced (4). To furnish further evidence regarding the function of the adrenal cortex in scurvy the urinary excretion of 17-ketosteroids has been studied in both normal and scorbutic female guinea pigs. As inanition per se reduces the urinary excretion of 17-ketosteroids (5), the paired feeding technique has been used during this investigation.

EXPERIMENTAL

Young female guinea pigs were housed in individual metabolism cages and fed a scorbutic diet, either with or without the supplement of ascorbic acid, by the paired feeding technique as described previously (1). The daily output of urine of each animal was collected in a flask containing concentrated hydrochloric acid and kept in a refrigerator. This was continued for 4 weeks. Urine was collected in 7 day periods from four to six animals on the scorbutic diet only and also from the corresponding pair-fed animals receiving ascorbic acid. 17-Ketosteroids from each 7 day sample were extracted and estimated by the method of Davison, Koets, and Kuzell (6) by means of a Lumetron photoelectric colorimeter with a 515 m\textmu filter. In order to compensate for the colored impurities present in the extract, a blank estimation was carried out in addition to the usual reagent blank, as suggested by Holtorff and Koch (7). The results are given in Table I.

DISCUSSION

During the 1st week of the experiment the urinary excretion of 17-ketosteroids did not differ significantly in the guinea pigs fed a scorbutic diet either with or without the supplement of ascorbic acid. From the 2nd
week guinea pigs which were fed only the scorbutic diet began to excrete progressively smaller amounts of 17-ketosteroids in the urine; the excretion became minimal during the 4th week, when the animals developed scurvy. The urinary excretion of 17-ketosteroids did not vary significantly in the different periods for the pair-fed guinea pigs receiving ascorbic acid. From the middle of the 2nd week the food consumption by the animals on the scorbutic diet alone gradually diminished. The pair-fed animals which

**Table I**

*Urinary Excretion of 17-Ketosteroids by Female Guinea Pigs*

The results are in mg. excreted per animal per day.

<table>
<thead>
<tr>
<th>Group No.</th>
<th>1st wk.</th>
<th>2nd wk.</th>
<th>3rd wk.</th>
<th>4th wk.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Normal (6) *</td>
<td>0.70</td>
<td>0.71</td>
<td>0.70</td>
</tr>
<tr>
<td></td>
<td>Scorbatic (6)</td>
<td>0.75</td>
<td>0.54</td>
<td>0.54</td>
</tr>
<tr>
<td>2</td>
<td>Normal (6)</td>
<td>0.75</td>
<td>0.75</td>
<td>0.74</td>
</tr>
<tr>
<td></td>
<td>Scorbatic (6)</td>
<td>0.80</td>
<td>0.57</td>
<td>0.59</td>
</tr>
<tr>
<td>3</td>
<td>Normal (4)</td>
<td>0.78</td>
<td>0.80</td>
<td>0.82</td>
</tr>
<tr>
<td></td>
<td>Scorbatic (4)</td>
<td>0.82</td>
<td>0.63</td>
<td>0.60</td>
</tr>
<tr>
<td>4</td>
<td>Normal (4)</td>
<td>0.85</td>
<td>0.83</td>
<td>0.83</td>
</tr>
<tr>
<td></td>
<td>Scorbatic (4)</td>
<td>0.83</td>
<td>0.60</td>
<td>0.61</td>
</tr>
<tr>
<td>5</td>
<td>Normal (6)</td>
<td>0.77</td>
<td>0.75</td>
<td>0.75</td>
</tr>
<tr>
<td></td>
<td>Scorbatic (6)</td>
<td>0.71</td>
<td>0.50</td>
<td>0.51</td>
</tr>
<tr>
<td>6</td>
<td>Normal (6)</td>
<td>0.70</td>
<td>0.69</td>
<td>0.75</td>
</tr>
<tr>
<td></td>
<td>Scorbatic (6)</td>
<td>0.72</td>
<td>0.55</td>
<td>0.53</td>
</tr>
</tbody>
</table>

Average, normal........... 0.75 ±0.05 0.75 ±0.04 0.76 ±0.04 0.77 ±0.02

“ scorbutic........... 0.77 ±0.03 0.57 ±0.04 0.56 ±0.03 0.51 ±0.04

Difference of means........... 0.02 0.18 0.20 0.26

Standard error of difference... 0.06 0.05 0.05 0.03

t........... 0.33 3.6 4.0 8.6

*The figures in parentheses indicate the number of animals.

received ascorbic acid, therefore, suffered from inanition. Inanition, however, was found to have no marked effect on the urinary excretion of 17-ketosteroids by these animals. In scorbutic guinea pigs not only are liver glycogen (8), adrenal cholesterol, and adrenal ascorbic acid (1) diminished, but also there is less excretion of 17-ketosteroids. The evidence thus brought forward seems to indicate a hypofunction of the adrenal cortex in scurvy.

**SUMMARY**

17-Ketosteroids were estimated in the urine of scorbutic and pair-fed, normal, female guinea pigs.
Scorbutic female guinea pigs excreted significantly lowered amounts of 17-ketosteroids in the urine.

It has been suggested that scorbutic guinea pigs suffer from hypofunction of the adrenal cortex.

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BIBLIOGRAPHY

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Sachchidananda Banerjee and Chandicharan Deb


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