Biology of Reproduction in the Squirrel Monkey (*Saimiri sciureus*): III. Ultrastructure of the Endometrial Glandular Cell during Estrogen and Progesterone Feeding

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**ABSTRACT.** Electron microscopic study of the endometrial glandular epithelium of the squirrel monkey (*Saimiri sciureus*) revealed the following three types of cells (1) principal, (2) mucus, and (3) ciliated cells. We further observed that these cells undergo morphologic changes in response to estrogen and progesterone feeding. The morphologic changes observed in the principal and mucus cells represent phases in the transformation of relatively poorly differentiated cells into mature functioning cells. The mucus cells elicit an accelerated maturation and functional change. The morphologic changes of the ciliated cells were least obvious.

**INTRODUCTION**

Use of squirrel monkeys (*Saimiri sciureus*) in biomedical research is only second to that of rhesus monkeys. We adopted this smallest of the new world species of the monkey as a human model to study the ultrastructure of the endometrium in response to estrogen and progesterone therapy. Familiarity with the endometrial alterations produced by hormonal contraceptives may facilitate the study of their mechanism of action and the control of cell differentiation. A better understanding of these phenomena may lead to new contraceptive approaches. A description of the fine structures of the endometrial glandular cell is the subject of this report.

**MATERIALS AND METHODS**

Endometrial tissue was obtained by a previously described technique (Srivastava et al., 1970) from five oophorectomized hormone fed squirrel monkeys. Estrogenic and progestational compounds were fed following the regimen presented in Table 1 and Figure 1. Endometrial tissue was obtained from the uterine fundus as illustrated in Figure 2, on the 3, 7, 10, 14, and 17 days of treatment, in the last course of hormone feeding.

The endometrial tissue obtained was fixed in cacodylate buffered glutaraldehyde and post-fixed with osmium tetroxide. The tissue was dehydrated in progressive

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Table 1. Schedule of length and dates of Estinyl and Provera* feedings to oophorectomized squirrel monkeys. Endometrium was obtained in the last course of feeding.

<table>
<thead>
<tr>
<th>Monkey Nos.</th>
<th>Course of feeding</th>
<th>1st</th>
<th>2nd</th>
<th>3rd</th>
<th>4th</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>17 days</td>
<td>6.25'68 to 7.11</td>
<td>17 days</td>
<td>9.16'68 to 10.2</td>
<td>3 days</td>
</tr>
<tr>
<td>8</td>
<td>20 days</td>
<td>10.10'68 to 10.29</td>
<td>7 days</td>
<td>1.29'69 to 2.4</td>
<td>7 days</td>
</tr>
<tr>
<td>11</td>
<td>10 days</td>
<td>5.26'68 to 6.4</td>
<td>10 days</td>
<td>3.10'69 to 3.19</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>14 days</td>
<td>5.14'68 to 5.20</td>
<td>7 days</td>
<td>7.24'68 to 7.30</td>
<td>14 days</td>
</tr>
<tr>
<td>14</td>
<td>14 days</td>
<td>6.26'68 to 7.9</td>
<td>14 days</td>
<td>9.11'68 to 9.24</td>
<td>17 days</td>
</tr>
</tbody>
</table>

*For the first eight days Estinyl 0.02 mg (Schering Corp.) was fed alone, from day 9 to 17, both Provera 2.5 mg (Upjohn) and Estinyl were fed.

concentrations of ethanol, embedded in Epon 812 and sectioned on Porter-Blum MT-1 and MT-2 ultramicrotomes. Medium thin sections were first taken and stained with toluidine blue in order to localize areas to be chosen for ultrathin sections. Ultrathin sections were stained with lead citrate and uranyl acetate. Observation and photography was carried out on Hitachi HS-7S and RCA-EMU-4 electron microscopes.

RESULTS

We are able to identify three types of cells in the endometrial glandular epithelium of the squirrel monkey by electron microscopy. These three types are (1) the principal (Fig. 3), (2) the mucus (Fig. 4), and (3) the ciliated cells (Fig. 6). The principal cells are the most numerous. The mucus cells contain an abundance of lightly stained secretory vesicles and granules, and undergo an accelerated morphological changes in response to the hormones administered. The ciliated cells were seen to undergo slow morphological changes throughout the length of the hormone induced cycle.

PROGESTERONE

ESTROGEN

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17

DAYS

Fig. 1. Sequence of hormone administration and days of endometrial biopsy, indicated by arrows.