EFFECT OF ATROPINE AND ADRENALINE ON THE MORPHOLOGY OF MICE SPERMATOZOA

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There is some evidence that atropine interferes with pharmacologically induced ejaculation in the mouse (Loewe, 1938; Loewe & Puttuck, 1953) and alters the physical and chemical composition of semen of other animals (Dziuk & Norton, 1962; Dziuk & Mann, 1963). Very little, however, is known about the effect of adrenaline on the composition of semen, and of adrenaline and atropine on the morphology of spermatozoa. The following experiment was conducted to determine if there was any effect of the two drugs on the morphology of mouse spermatozoa.

Sixty colony-bred, adult, male albino mice (original stock from Italy and Germany) were allotted at random to three equal groups of twenty animals. One of the groups served as a control, and the control mice did not receive injections of saline. In another group, each mouse was given 0.72 mg atropine sulphate (B.D.H.) in 1.2 ml saline solution. In the third group, 0.06 mg adrenaline tartrate (B.D.H.) in 0.06 ml saline solution was administered to each mouse. The doses were injected subcutaneously in six equal sub-doses in 2 days. On the first day half of the dose, and on the following day the remaining half, was administered by three injections at an interval of 2 hr between injections. During the days on which the injections were given, the mice of the three groups were kept in an air-conditioned room where the air temperature varied between 25 and 27°C. Two hours after the last injection, mice of the three groups were killed by dislocation of the neck. Four permanent nigrosin-eosin slides were prepared from the mixed contents of the two vasa deferentia of each male. The 240 slides were coded and examined in a randomized order. Under a projection microscope (linear magnification ×6169) similar to one described by Beatty & Napier (1960) four unstained spermatozoa with normal acrosomal caps were chosen at random from each slide. Each spermatozoon was drawn on a separate sheet of paper. From the drawings, the maximum breadth and projected area of the sperm head, and the length, breadth and projected area of the midpiece were measured as described by Beatty & Mukherjee (1963). In addition to the mensuration characteristics, the percentage of unstained and beaded spermatozoa was scored from fifty spermatozoa per slide by using an oil immersion objective and ×10 eye-piece with a blue light filter.

Group means of the sperm characteristics and the details of analysis of variance are given in Table 1. Mean square between mice within group was used to test the mean square between groups. Statistically significant variations
Table 1
GROUP MEANS AND ANALYSIS OF VARIANCE OF SPERM CHARACTERISTICS

<table>
<thead>
<tr>
<th>Group means</th>
<th>Degrees of freedom</th>
<th>Head area ($\mu^2$)</th>
<th>Head breadth ($\mu$)</th>
<th>Midpiece area ($\mu^2$)</th>
<th>Midpiece length ($\mu$)</th>
<th>Midpiece breadth ($\mu$)</th>
<th>Angular percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control mean</td>
<td></td>
<td>22.6</td>
<td>3.502</td>
<td>16.4</td>
<td>22.74</td>
<td>0.721</td>
<td>53.72</td>
</tr>
<tr>
<td>Atropine mean</td>
<td></td>
<td>22.5</td>
<td>3.546</td>
<td>16.1</td>
<td>22.56</td>
<td>0.712</td>
<td>55.54</td>
</tr>
<tr>
<td>Adrenaline mean</td>
<td></td>
<td>22.4</td>
<td>3.548</td>
<td>15.7</td>
<td>22.71</td>
<td>0.691</td>
<td>55.43</td>
</tr>
<tr>
<td>Analysis Groups</td>
<td>2</td>
<td>0.41</td>
<td>0.071</td>
<td>10.61*</td>
<td>0.880</td>
<td>0.019*</td>
<td>83.2</td>
</tr>
<tr>
<td>Mice within group</td>
<td>57</td>
<td>2.54**</td>
<td>0.026**</td>
<td>9.18**</td>
<td>0.942**</td>
<td>0.006**</td>
<td>147.32**</td>
</tr>
<tr>
<td>Slides within mice</td>
<td>180</td>
<td>1.32</td>
<td>0.011</td>
<td>1.35</td>
<td>0.163</td>
<td>0.002</td>
<td>61.69</td>
</tr>
</tbody>
</table>

* 0.05 > P > 0.025. ** 0.005 > P.
in the midpiece area and breadth were found between groups. The midpiece area and breadth were smaller in the adrenaline-treated group as compared with those in the control group. Between adrenaline and atropine and between atropine and control groups, variations were not statistically significant. Midpiece area and breadth decreased when the amount of oxygen in the inspired air was reduced by substitution with CO\textsubscript{2} or nitrogen (Mukherjee & Singh, 1967, 1968; Kumar & Mukherjee, 1968). The injection of adrenaline produced a similar effect and it is possible that adrenaline acts by reducing the blood supply (and hence the oxygen supply) to the testes and vasa deferentia. In the present experiment, as in the previous experiments, fully matured spermatozoa from the vasa deferentia and not immature growing spermatozoa from the testes were studied. Further work showed that succinic dehydrogenase activity in the midpiece of spermatozoa of adrenaline-injected mice was considerably reduced. Details about this aspect of the work will be published elsewhere.

REFERENCES


