THE EFFECT OF ANTICHOLINESTERASE PREPARATIONS ON
THE DARK ADAPTATION OF THE EYE

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(Received September 16, 1956. Submitted by Active Member of the Acad. Med. Sci. SSSR V.N. Chernigovsky)

The present work is a continuation of investigations carried out in this department on the study of the
effect of anticholinesterase preparations on various functions of the body [6,7,8 and 9]. Its object was to invest-
igate the effect of eserine and prostigmin on the dark adaptation of the eye in the healthy human subject.

EXPERIMENTAL METHOD

After a 30 minute period of dark adaptation in a dark room, a 5 minute exposure to light was given.
Thereafter, every 5 minutes, the light sensitivity of areas of the retina situated within 15° of the macula was
measured with a Nagel adaptometer during adaptation of the eye to darkness.

The light sensitivity of the eye was determined by a Kravkov-Vishnevsky apparatus and a model "AM"
Belostotsky-Hoffmann adaptometer in accordance with its operational instructions.

For each subject we determined the rate of dark adaptation and the light sensitivity of the eye before
and after the intramuscular injection of physiological saline (0.6 ml) and after intramuscular injection of the
preparations. The following preparations were used; eserine (Physostigminum salicylicum [Merck] in a dose
of 0.2-0.6 mg, prostigmin (Prostigminum [La Roche]) and proserine* (Proserinum, [NIKhFl]), in doses of 0.15-
0.3 mg. To determine the duration of the action of the anticholinesterase preparations, the dark adaptation
and light sensitivity of the eye were examined for 2 days.

EXPERIMENTAL RESULTS

The rate of adaptation, measured by Nagel's apparatus, is shown from results of 41 observations (Tables
1 and 2).

In the normal subject with no preparation injected or after injection of physiological saline, dark adapt-
ation of the eye was effected in 25-50 minutes, being complete on the average in 41 minutes. All the ex-
periments of injection of physiological saline gave the same results as without injection. Injection of all the
anticholinesterase preparations gave acceleration of adaptation by 2-5 times (average 3) in all experiments
without exception.

In the normal subject, without injection and after injection of physiological saline, the threshold of dark

* Prostigmin and proserine are identical preparations (the methyl sulfate of the dimethylcarbamino complex
ether of oxyphenyltrimethylammonium).
adaptation of the eye averaged 2400-4000 Nagel adaptometer units, with a mean value of 3200. Injections of anticholinesterase preparations increased the sensitivity of the eye by \(1 \frac{1}{4} - 2\) times, with a mean of \(1 \frac{1}{8}\) times. It was shown by special observations that the action of prostigmin (in a dose of 0.3 mg) lasted 37 hours in subject I. N., after which the rate of dark adaptation and the level of light sensitivity were restored to their original values.

**TABLE I**

Rate of Dark Adaptation by Nagel’s Method in Several Experiments

<table>
<thead>
<tr>
<th>Subject</th>
<th>With no preparation injection</th>
<th>After injection: of physiological saline of eserine of prostigmine of proserine</th>
<th>Coefficient of acceleration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Age 46 years</td>
<td>19 years 10 years 19 years 26 years 19 years</td>
<td></td>
</tr>
<tr>
<td>O.M.</td>
<td>35.35.35.40</td>
<td>50.50 30.35 30.10 35 25.25</td>
<td>2.2-2.0</td>
</tr>
<tr>
<td>L.N.</td>
<td>10</td>
<td>10 10 10 10 10 10 10 10 10</td>
<td></td>
</tr>
<tr>
<td>A.D.</td>
<td>30</td>
<td>30 30 30 30 30 30 30</td>
<td>3.0</td>
</tr>
<tr>
<td>Arithmetic mean</td>
<td></td>
<td>41</td>
<td></td>
</tr>
</tbody>
</table>

The light sensitivity of the eye was determined in 24 subjects (44 investigations) with the Kravkov-Vishnevsky apparatus and in 44 subjects (50 investigations) with the Belostotsky-Hoffmann adaptometer.

The curves in Fig. 1 demonstrate the changes in the light sensitivity of vision in 24 subjects after intramuscular injection of physiological saline and eserine (taken from mean values). The abscissa represents time after injection in minutes and the ordinate shows the time in seconds during which the subject distinguished the object placed in the apparatus. After injection of eserine the time of distinguishing the object was shortened from 37.8 to 12.4 seconds, i.e., threefold. In some experiments it was reduced to 2-3 seconds.

Fig. 1. Effect of eserine on light sensitivity of the normal eye as determined by the Kravkov-Vishnevsky apparatus (mean of 44 observations on 24 subjects).