Streptozotocin-produced cataracts in rats

J. H. White and A. A. Cinotti

Cataract in rats produced by administration of Streptozotocin is not related to its antimitotic effect but appears to be related to its diabetogenic effect, as investigated with the use of the antidiabetic protective action of nicotinamide.

Key words: Streptozotocin, nicotinamide, cataract, diabetes, rat

Streptozotocin, an antibiotic produced from Streptomyces achromogenes, is now being used frequently for the production of experimental cataract.1-4 The exact mechanism of this cataract formation has not yet been determined. Streptozotocin has two distinct properties, either of which it was considered could be responsible for the cataract formation.

First, Streptozotocin possesses the property of selective destruction of the beta cells of the pancreas in monkeys, dogs, and rodents, producing diabetes mellitus.5 Second, Streptozotocin possesses antimitotic properties when used in rats and mice with lymphoid leukemia.6

To investigate which of these properties might be responsible for the cataract formation, nicotinamide was used in the experiment described below. Nicotinamide has been found to protect rats against the pancreolytic effect of Streptozotocin but to have no action on its antitumor properties.7

Method

Fifty adult albino rats, weighing between 150 and 200 grams, were used in the investigation. They were divided into two equal groups. Group I was given Streptozotocin by sublingual intravenous injection in a dose of 62.5 mg. per kilogram after a fasting period of 24 hours. Group II received the same dosage of Streptozotocin under the same conditions but also received nicotinamide in a dose of 500 mg. per kilogram. The nicotinamide was given by intraperitoneal injection 15 minutes before the administration of the Streptozotocin. The urine of each rat was tested for the presence of sugar 24 hours after injection.

Rats which developed cataract observable by both slit lamp and ophthalmoscope were killed, and the blood sugar levels were measured by the Glucostat (Worthington) method. These measurements were obtained at intervals from six to 12 weeks after the administration of Streptozotocin. At the end of three months, all surviving rats were killed, and the terminal blood sugar levels were measured with the same method.

During the course of the investigation the rats were observed daily under mydriasis for onset of cataract8 by means of both slit lamp and ophthalmoscope.

Results

It will be seen from the results shown in Table I that none of the rats in Group II, which were protected by nicotinamide, developed sugar in the urine, an elevated blood sugar level, or cataract. However, all of the rats in Group I, which received
Table I

<table>
<thead>
<tr>
<th>Group</th>
<th>No. of rats with:</th>
<th>Blood sugar (mg. %)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Streptozotocin</td>
<td>Nicotinamide</td>
</tr>
<tr>
<td>I</td>
<td>25</td>
<td>0</td>
</tr>
<tr>
<td>II</td>
<td>25</td>
<td>25</td>
</tr>
</tbody>
</table>

Streptozotocin alone, developed sugar in the urine, elevated blood sugar levels, and cataracts.

The antitumor effect of the Streptozotocin, which is unaffected by nicotinamide administration, did not cause cataract.

The cataract would appear, therefore, to be solely related to the diabetogenic effect of the Streptozotocin.

REFERENCES