Restitution of Ceric Sulphate-induced Sterility in Rats by Zinc and Speman

Mathur, R. and Reena Kulshrestha
School of Studies in Zoology, Jiwaji University, Gwalior, India.

INTRODUCTION
With the growth of the chemical industry a number of new compounds are attaining wide use. Some of them have been found to have deleterious effects on the reproductive organs. Cerium is attaining wide application in ceramic and glass industries, medicine, as catalytic agent and in nuclear technology. This presentation of ours reports some interesting results on the effect of ceric sulphate on the fertility of male albino rats.

MATERIALS AND METHODS
Colony bred fertile albino rats were selected for the experimentation. They were divided into the following groups and injected various doses subcutaneously (s.c.) as follows:

<table>
<thead>
<tr>
<th>Group</th>
<th>Treatment</th>
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<tr>
<td>I (30 rats)</td>
<td>was treated as control and injected the vehicle (distilled water) only. Five rats were sacrificed for every autopsy.</td>
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<td>II (7 rats)</td>
<td>was administered 1 ml of 1 m mole ceric sulphate/100 gm body weight (minimum effective dose for 7 days) and autopsied on day 8.</td>
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<td>III (7 rats)</td>
<td>was administered ceric sulphate as above, followed by 0.4 mg. Zinc sulphate for 7 days and autopsied on day 8.</td>
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<td>IV (7 rats)</td>
<td>was treated like Group II but autopsied on day 150.</td>
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<td>V (7 rats)</td>
<td>was treated like Group III but autopsied on day 58.</td>
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<tr>
<td>VI</td>
<td>was treated like Group III but treatment was followed by injections of Speman (The Himalaya Drug Co.) on alternate days and autopsied on day 45.</td>
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Rats from Groups IV, V, VI were left every fortnight with the fertile pro-oestrous females in the ratio of 1 male to 3 females to observe the restitution of fertility. At every test the vaginal smear was observed for the presence of sperms.
All the animals were kept under uniform husbandry conditions with food and water *ad libitum*.

On the day of autopsy the testes and accessory reproductive organs were removed from the animals and processed to obtain 6 µ thick paraffin sections. They were stained with haematoxylin and eosin and studied under a Carl Zeiss research microscope. All the round tubules showing any histological abnormality were counted along with the total number of seminiferous tubules to find out the percentage damage.

1ml of 1m mole/100 gm body weight ceric sulphate when administered for 7 days induced sterility. Histological damage was observed in 45% tubules. Some of them were shrunken while others showed anastomosis. Some of them completely lost their tubular appearance and looked under liquidation, loaded with many nuclei while in others the lumen was persistently either empty or filled with fluid. Many of the tubules had very thin basement membrane to which only a few unaffected germ cells were attached. The Leydig cells were normal but the stroma was considerably reduced (Fig.2). Mononucleate giant cells were observed in some tubules. Blood vessels were engorged. Spermatids and spermatocytes showed severe reduction in their number. After a lapse of 149 days better organisation of germ cells was observed, although all the tubules did not attain normal structure. Most of the tubules contained spermatozoa but some debris was also seen. Anastomosis still persisted in some peripheral tubules,. Spermatozoa were more eosinophilic. The stroma was in the stage of reappearance and showed a close network of fibrous connective tissue. Abnormal spermatozoa were observed in many tubules.

Group III animals showed reduced tubular diameter and very small lumen. The stroma had atrophied but Leydig cells had almost normal distribution. The testes showed better organised structure (Fig. 3). However, spermatozoa were few in the normal looking tubules.

Rats of Group IV showed a better organisation of the tubules. Only a few tubules showed anastomosis and exfoliation of germ cells. When mated with the females the males of this group showed recovery from sterility as implantation sites are observed.

Rats of Group V looked normal except that some central tubules had deformed structure. The stroma showed reappearance to some extent. Stages of spermatogenesis could be identified in the peripheral tubules. The Leydig cells showed normal structure and distribution.

The histological picture had considerably improved (Fig.4) in Group VI rats but they had not attained normal diameter although the stroma was established. All the fertility tests of this group showed the presence of normal spermatozoa, and implantation sites were observed on the 10th day after mating.
Results of the present investigation indicate that ceric sulphate induces sterility at 1 ml of 1m mole dose/100 gm body weight for 7 days. It is interesting that the libido of the rats is maintained which leads to the view that the sterility might be induced due to formation of abnormal spermatozoa. Failure of implantation might be due to destruction of these spermatozoa in the female genital tract by an unspecific mechanism of the rat uterus. This observation also strengthens the view that the sterility caused by ceric sulphate does not accrue from the disturbance in androgenic support to the genital tract, as the Leydig cells do
persist although the stroma has atrophied. The animals regained their fertilising capacity after about five months of the last treatment. However, all the damaged tubules do not attain normal structure by this time.

Treatment of rats with ceric sulphate plus zinc sulphate induces lesser histological alterations and fertility is lost for only 58 days. This may be due to the protective action of zinc sulphate against the tubular epithelial deformation\textsuperscript{1,3,8}.

Speman, a plant preparation of The Himalaya Drug Co., has shown considerable decrease in the period of sterility as implantation takes place after 45 days of the last dose in Group VI rats.

**SUMMARY**

1 ml of 1 m mole/100 gm body weight dose of ceric sulphate (minimum effective dose) when administered in albino rats for 7 days causes sterility, which is re-established in about five months. Zinc and Speman, however, induce beneficial effects.

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**REFERENCES**