HISTOLOGICAL FINDING OF MICE TESTES FOLLOWING FLUORIDE INGESTION

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SUMMARY: The study was designed in order to assess the relationship between infertility and histological structure of testes following administration of varying doses of sodium fluoride. One hundred adult male albino mice were fed 10 ppm (Group A), 500 ppm (Group B) and 1000 ppm (Group C) of sodium fluoride in drinking water. The Group A animals were sacrificed at the end of one month, Group B after two and Group C after three months. The testes were removed and, after being processed in the usual manner, they were stained with hematoxylin and eosin. In Groups B and C, the higher dosage groups, there was a lack of maturation and differentiation of spermatocytes. In animals sacrificed at the end of three months, spermatogenesis had stopped and the seminiferous tubules had become necrotic. A definite relationship between fluorosis and damage to the testes has, therefore, been established by this study.

Introduction

Our rapidly expanding industrialization with its accompanying hazards to human health is responsible for an increasingly wide and complex range of health problems. One of the most widespread disorders resulting directly from environmental pollution is *fluorosis* - a crippling disorder affecting bone, teeth and soft tissues - caused by the cumulative action of fluoride ingestion over prolonged periods.

Among the effects on soft tissues associated with fluoride, that on testes has been least studied although a definite correlation between infertility and fluorosis has long been observed (1, 2). The aim of the current study was to assess the histological changes in testes following prolonged ingestion of fluoride.

Material and Method

A total of 100 adult male albino mice were divided into 4 groups of 25 each A, B, C and D. Group D served as control. All animals were kept under identical laboratory conditions and fed a standard laboratory diet.

Group A was given 10 ppm sodium fluoride in drinking water (10 mg/l),

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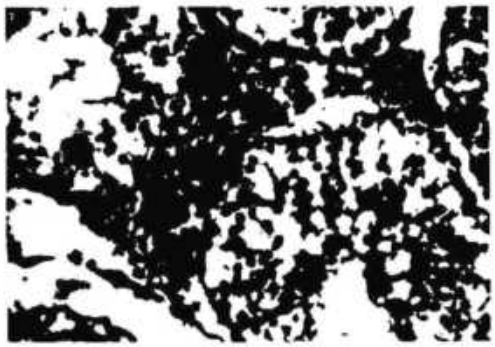
Figure 1

Testis of Mouse Fed 500 ppm NaF for 1 Month (x200)



Lack of differentiation and maturation of spermatocytes. Marked infiltration in the interstitial area of testicular tubules.

Figure 2

Testis of Mouse Fed 1000 ppm NaF for 3 Months (x200)

Complete atrophy of seminiferous tubules. No normal spermatocytes or spermatids are seen.

Group B, 500 ppm and Group C,1000 ppm. The control group received drinking water without fluoride. All Group A animals were sacrificed after 30, Group B after 60 and Group C after 90 days of fluoride administration.

The animals were anesthetized with chloroform and,after opening their chest cavity, they were perfused with 10% neutral formaline through the left ventricle. The abdominal cavity was opened and the testes were removed after being freed from the surrounding tissue. The tissue was kept in a 10% neutral formalin solution for fixation. After one week, the tissues were washed for 24 hours under running tap water,then dehydrated through ascending grades of alcohol, cleared in xylene and embedded and blocked in paraffin. Sections 5 - 7 µg thick were taken and stained with hematoxyline and eosin.

Results

Macroscopically, the testes of the experimental animals appeared normal in size, shape and color compared with the controls. Microscopically Group A, that received lowest dose (10 ppm), exhibited no changes in the testes at the end of experimental period of three months. The tubules, interstial cells and the process of maturation and differentiation of spermatocytes appeared to be normal.

In Groups B and C (500 and 1000 ppm fluoride), a few areas of necrosis in the seminiferous tubules were seen after one month of fluoride administration. Some of the tubules showed a lack of differentiation and maturation of spermatocytes (Fig. 1). However only a few such tubules were found.

At the end of three months, the degenerative changes were more pronounced at which time most of the tubules showed a lack of differentiation and maturation of spermatocytes. Tubular atrophy and necrosis was also much more evident (Fig. 2) than in those sacrificed at the earlier stages of fluoride intoxication.

In the control animals, the semniferous tubules were normal in shape and structure (Fig. 3), spermatogenesis was normal and a normal amount of sperms were seen in the tubular lumen.

Figure 3

Normal Testis of Control Mouse (x200)

Compactly arranged seminiferous tubules. Spermatogenesis at different stages. Less interstitial tissue than in Fig. 1.

Discussion

The evidence of infertility due to fluoride intoxication in experimental animals presented in 1925 (1) and in 1952 (2), has thus been confirmed by the histological study on testes in the present investigation which revealed marked degenerative changes such as necrosis of seminiferous tubules and lack of differentiation and maturation of spermatocytes.

The available literature on the effects of fluoride toxicity on the various tissues does not give a precise picture of the structural alterations occurring in various cell components of the testes. A more recent study by Messer, et al. (3) failed to show any change in reproduction of mice fed concentrations of fluoride of the order of 0.1 to 0.3 ppm on a diet deficient in iron, calcium and magnesium. However these authors reported a definite decline in the reproduction of mice when they were fed 100 - 200 ppm fluoride.

The present investigation has therefore given clear evidence regarding the manner in which infertility is induced in animals receiving large doses of fluoride as described by earlier authors.

Bibliography

1. Schulz, J.A. and Lamb, A.R.: The Effect of Fluorine as Sodium Fluoride on Growth and Reproduction of Albino Rats. Science, 61:93-94, 1925.
2. Udall, D.H. and Kellers, K.P.: A Report on Fluorosis in Cattle in Columbia River Valley. Cornell Vet. 42:159-84, 1952.
3. Messer, H.H., Armstrong, W.D. and Singer, L.: Influence of Fluoride Intake on Reproduction in Mice. J. of Nutr. 103:1319-26, 1973.