



Manuscript ID:
IJRSEAS-2025-020612



Quick Response Code:



Website: <https://eesrd.us>



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DOI: 10.5281/zenodo.18337273

DOI Link:
<https://doi.org/10.5281/zenodo.18337273>

Volume: 2

Issue: 6

Pp. 60-62

Month: December

Year: 2025

E-ISSN: 3066-0637

Submitted: 10 Nov. 2025

Revised: 16 Nov. 2025

Accepted: 15 Dec. 2025

Published: 31 Dec. 2025

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How to cite this article:

Rahatgaonkar, R. L. (2025). Effect
Of Feeding Albino Mice with
Irradiated Food on Body and
Organ Weight and Histopathology.
International Journal of Research
Studies on Environment, Earth, and
Allied Sciences, 2(6), 60–62.
<https://doi.org/10.5281/zenodo.18337273>

Effect Of Feeding Albino Mice with Irradiated Food on Body and Organ Weight and Histopathology

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Abstract

The present study was undertaken to observe and investigate the effect of high dose of X-ray irradiated food on body and organ weight and histopathology of reproductive organs of male albino mice. The body and organ weight showed sharp decline in treated mice. The histopathology architecture of male reproductive organs i.e. testis, epididymis and seminal vesicle marked with some degenerative changes after 60 days of feeding treatment. Histopathological examinations of reproductive organs were performed using standard staining techniques. The results revealed a significant decline in body weight and reproductive organ weight in mice fed with irradiated food compared to the control group. Histological observations showed marked degenerative changes in the testicular architecture, including shrinkage of seminiferous tubules, reduction in spermatogenic cells, and degeneration of Leydig cells following prolonged exposure. The study indicates that consumption of irradiated food induces adverse effects on reproductive physiology, possibly due to its anti-androgenic and antianabolic actions. These findings highlight the potential biological risks associated with long-term intake of irradiated diets.

Key words: Irradiated food, albino mice, reproductive organs, histopathology, X-ray irradiation.

Introduction

In the modern age of agriculture sector food irradiation is an important application and key process of exposing food and food packaging to ionizing radiation, such as from gamma rays, x-rays, or electron beams. WHO (1988). Food irradiation improves food safety and extends product preserved by effectively destroying organisms responsible for spoilage and causes health problems which inhibits the spoilage of food materials by controlling insects and invasive pests. CFIA(2016). When the food material is treated with X-rays they are produced by bombardment of dense target material with high-energy accelerated electrons. In other way it is also term as bremsstrahlung giving rise to a continuous energy spectrum. Fellows,P.J. (2018). As a result there have been occasions when human beings are exposed to radiations either acutely or chronically resulting increased of late somatic effects, such as induction of cancer or genetic effects which may result into hereditary diseases. The consumption of irradiated food seems to be associated with greater risk in malnourished populations. Keeping in view the above facts, present study has been designed accordingly so as to observe the evidence of toxic effects on albino mice feed with irradiated diet.

Material And Methods

Swiss albino male mice weighing 30 ± 2 g maintained on standard ready made feed and water ad-libitum. Animal experimentation was conducted according to “INSA- Ethical guideline for use of animals in scientific research” published by CDRI, Lucknow, India.

Irradiation of Diet:

Wheat and gram were separately soaked in water for 48 hrs before being irradiated. Lots of 1.25 kg soaked wheat and grams were taken in aluminium containers separately and were exposed to X-rays at a dose rate 80KV, 100MAS distance. Simultaneously, the un- irradiated wheat and gram for control diet were also soaked in water for 48 hrs to serve as control. The mice were randomly divided into two groups and were housed in separate cages under identical conditions.

Group –I: 10 male mice received unirradiated normal food treated as control.

Group-II: 10 male mice were given irradiated food treated as experimental.

Feeding of control and experimental mice were started from 3rd day of post-irradiation. Equal amount of food was given every evening and water ad-libitum. Any food left in cages was removed.

Survival and weight loss studies:

Mice of control and experimental groups were kept under observation for

mortality. Weight of each surviving mice was recorded every alternate day up to 60 days.

The male mice (control & experimental) were killed by decapitation after 30 and 60 days of feeding. Every time body weight was recorded prior to sacrifice. Testis, epididymis and seminal vesicle were quickly removed and weighted to the nearest of 0.1mg and fixed in Bouin's fluid for histopathological studies. After fixation of tissues, they were washed and further processed to take micro-thick paraffin sections. The sections were stained with Haematoxylin-Eosin.

Result And Discussion

The male mice were fed on X-ray irradiated diet for 60 days and were assessed for any change in body and organ weight after treatment.

Behavioural studies:

Control mice exhibited normal movements, sleeping hours, feeding and drinking activities, whereas mice feed with X-ray irradiated diet mixed type of behaviour i.e. lethargic and aggressive. During the course of studies, the experimental mice showed allergic reactions on their body parts particularly on posterior half. The slight decrease in body weight was observed in experimental male mice than control after 30 and 60 days of treatment (Table-1). The reproductive organ weight of testis and epididymis was decreased than the seminal vesicle as compared to the control one during the course of treatment.

Histological observation:

Testicular sections of the control mice had normal histological structure that consisted of uniform, well-organized seminiferous tubules with complete spermatogenesis and normal interstitial connective tissue. Seminiferous tubules revealed an intact epithelium with full complements of spermatogenic cells and different cellular associations. Lumens filled with mature spermatozoa were also observed. Interstitial tissue had normal distribution of Leydig cells (Figure 1A).

The male mice feed on X-ray irradiated food up to 60 days exhibit severe alterations in testicular architecture. It showed marked degenerative changes, atrophy in the size of seminiferous tubules and this is accompanied by subsequential reduction in the number of spermatogonial cells and spermatocytes resulted in reduction number of spermatids. Leydig cells are shrunken and the nuclei with reduced diameter. After chronic feeding treatment the histological structure of testis showed tubular deformation, necrotic and degenerative changes in germinal epithelium. (Figure 1B).

Table:1 Body weight and organ/tissue weight of male Albino mice feed on X--ray irradiated food for 60 days

S.N	Body weight and organ/tissue weight	Days of Treatment		
		Control/Expt.	30 Days	60 Days
1	Body Weight(g)	Control	40.08±1.08	46.18±1.10
		Experimental	32.40±1.35	31.28±0.96
2	Testis (mg)	Control	121.03±5.42	129.15±3.17
		Experimental	79.21±4.42	72.13±3.18
3	Seminal Vesicle (mg)	Control	82.90±1.12	85.64±4.51
		Experimental	76.25±1.10	70.44±5.40
4	Epididymis (mg)	Control	22.28±3.20	25.20±4.78
		Experimental	18.17±2.26	16.46±2.56

Results are means ± of SE of six replicates.

Figures in parenthesis indicate percentage change over control

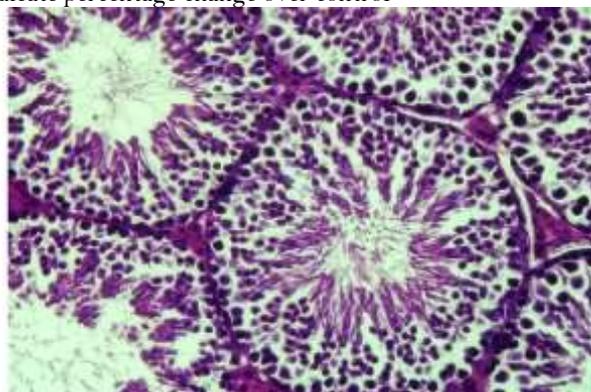


Figure 1(A). T.S of Testis of control mice showing normal structure of seminiferous tubules and spermatogenesis.

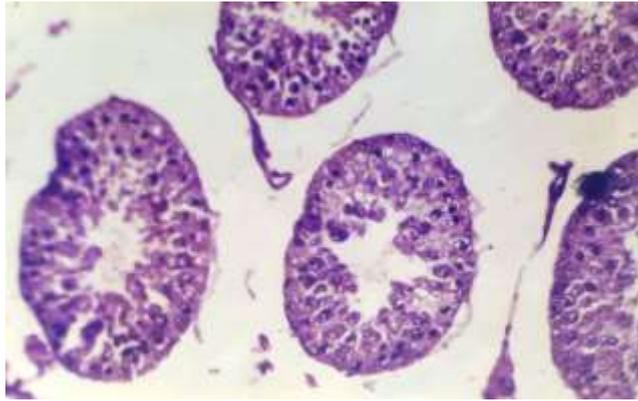


Figure 1(B): T.S. of Testis of treated mice exhibit irregular and break basement membrane, necrotic germinal epithelium, shrunken seminiferous tubules, subsequential reduction in the number of spermatogonial cells and spermatocytes and reduced Leydig cells.

No mortality was observed during the experimental period. The activities and body weight was monitored and recorded after every alternate day. The decrease in body weight and organ weight in X-ray feed male mice is due to the anti-androgenic effects of the irradiated food is coupled with its antianabolic action, as is evident from the results shown in Table-1 as well as the marked histological alterations in testis. Similar result was noted by Kushwaha and Hasan (1986) and French AB, Migeon C J, Samuel L T and Bowers J (1955). The irradiated food fed mice showed a marked atrophy in the size of seminiferous tubules and this was accompanied by the reduction in number of spermatogonial cells. Vijaylaxmi and Vishweswara Rao (1976) observed the significantly fewer germ cells. Kyung Ja Lee (1990) have reported the same findings. Ahsan A. Habbib et.al (2016) stated the same on testicular histological observations in male rabbit.

Conclusion:

The present investigation indicates that the male mice feed with the X-ray irradiated food causing androgen deprivation to the target organ which result in alteration in histopathology. The changes particularly in internal milieu of the testis intern renders the spermatozoa immotile. However, the effect of irradiated food via the pituitary-gonadal axis cannot be ruled out, as the testicular histology was also found to be affected.

Acknowledgment

The author expresses sincere gratitude to the Department of Zoology, Shri RLT College of Science, Akola, for providing the necessary laboratory facilities and academic support to carry out this research work. The author is thankful to colleagues and technical staff of the department for their cooperation and assistance during animal experimentation and histopathological analysis.

Special thanks are extended to the institutional authorities for permitting the use of laboratory infrastructure and for their constant encouragement. The author also acknowledges the contributions of researchers whose published work has been referred to in this study. Finally, heartfelt appreciation is conveyed to family members and well-wishers for their moral support throughout the course of this research.

Financial support and sponsorship

Nil.

Conflicts of interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

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