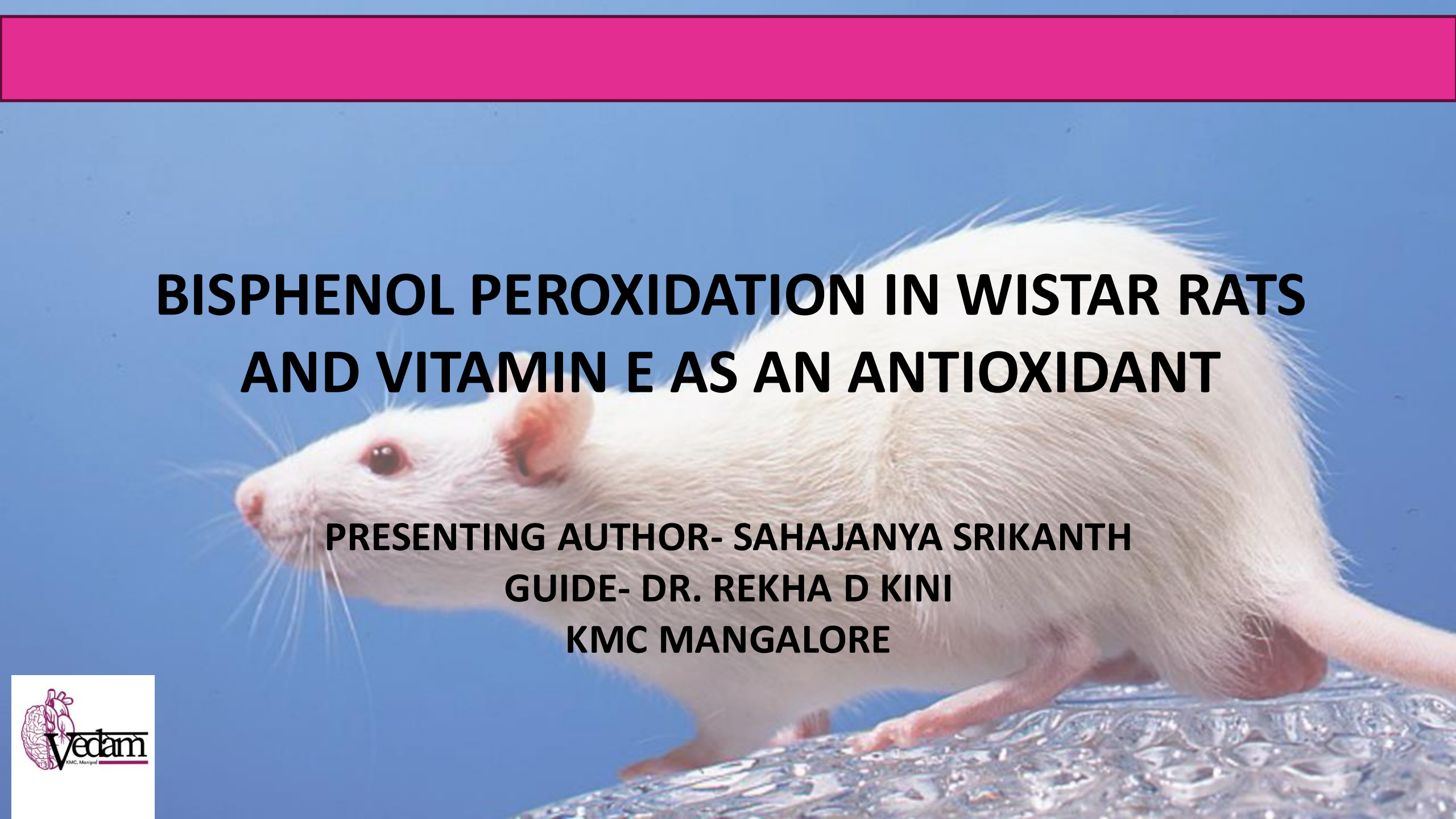
BISPHENOL PEROXIDATION IN WISTAR RATS AND VITAMIN E AS AN ANTIOXIDANT



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INTRODUCTION

- Bisphenol A (BPA) is an industrially manufactured chemical and a known pollutant.

- Bisphenol-A (BPA) is found abundantly in hard plastics used to make numerous consumer products such as baby bottles and water bottles.

- BPA exposure during embryonic/fetal periods is associated with tissue oxidative stress and peroxidation which leads to underdevelopment of certain organs including reproductive systems.

- BPA has been shown to dysregulate the cytokines and induce oxidative stress in the brain, liver, and kidneys.
- BPA is also a known endocrine disruptor.
- Antioxidants are best protectors against such oxidative stress.
- Vitamin E is one such dietary antioxidant which is known to decreases the adverse effects of reactive oxygen species produced by chemicals.

AIMS & OBJECTIVES

AIM

To study the potential role of vitamin E as an antioxidant on Bisphenol (BPA) induced oxidative stress in wistar rats

OBJECTIVES

1. Study the damaging effect of Bisphenol on testicular parameters.
2. Study the role of vitamin E on Bisphenol induced testicular damage.

METHODOLOGY

STUDY DESIGN

STUDY WAS DONE AFTER APPROVAL FROM INSTITUTIONAL ANIMAL ETHICAL COMMITTEE

Animals: Wistar Albino rats

Body weight: 150-200 grams

Chemicals: Bisphenol A (CAS NO:80-05-7, CAT No: 31817) from Sisco company and Vitamin E (Evion tablet)

ANIMAL GROUPING

Animals were divided into the following groups with 6 rats in each group

Group 1: Control Group (olive oil given orally) for 3 weeks.

Group 2: (Experimental control) vitamin E (100 mg/kg bw/day) dissolved in olive oil treated orally for 3 weeks.

Group 3: (Bisphenol treated) Bisphenol (25mg/kg bw/day) dissolved in olive oil orally for 3 weeks.

Group 4: (Vitamin E + Bisphenol treated group) rats pre-treated with vitamin E (100mg/kg bw/day) along with bisphenol (25mg/kg bw/day) for 3 weeks.

- Animals were euthanised by lethal dose of anaesthesia - Pentobarbitone (40mg/kg BW).

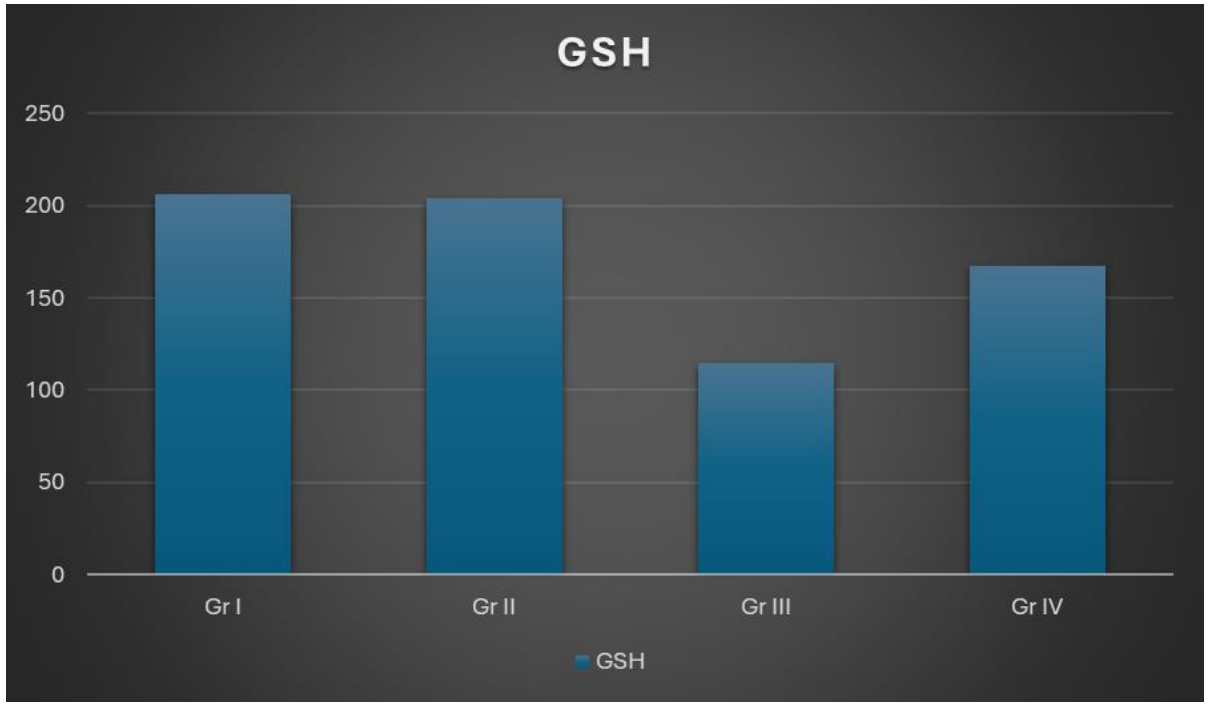
- Tissue level of MDA and GSH, testosterone level, total sperm count, and sperm shape abnormalities were studied.

- Histological assessment was also done.

RESULTS

TABLE 1- TESTICULAR TISSUE LEVEL OF GSH

GROUPS	GSH (ug/g tissue)
GR I	206.45±4.53
GR II	204.05±3.88^{NS}
GR III	114.44±3.35***
GR IV	167.14±5.63¶¶¶



Values are express as Mean±SEM. (n)=6.
P <0.05 is taken as significant.
NS (not significant) GR.I versus Gr.II & Gr. III versus Gr.IV
***P<0.0001, GR.I versus GR.III,
¶¶¶P<0.0001, GR.III versus Gr.IV

- Significant ($p<0.0001$) decrease in the testicular tissue level of GSH when compared to normal control group.

- Treatment with Vitamin E showed a significant increase in testicular GSH level (GR IV) compared to bisphenol intoxicated rats (GR III)

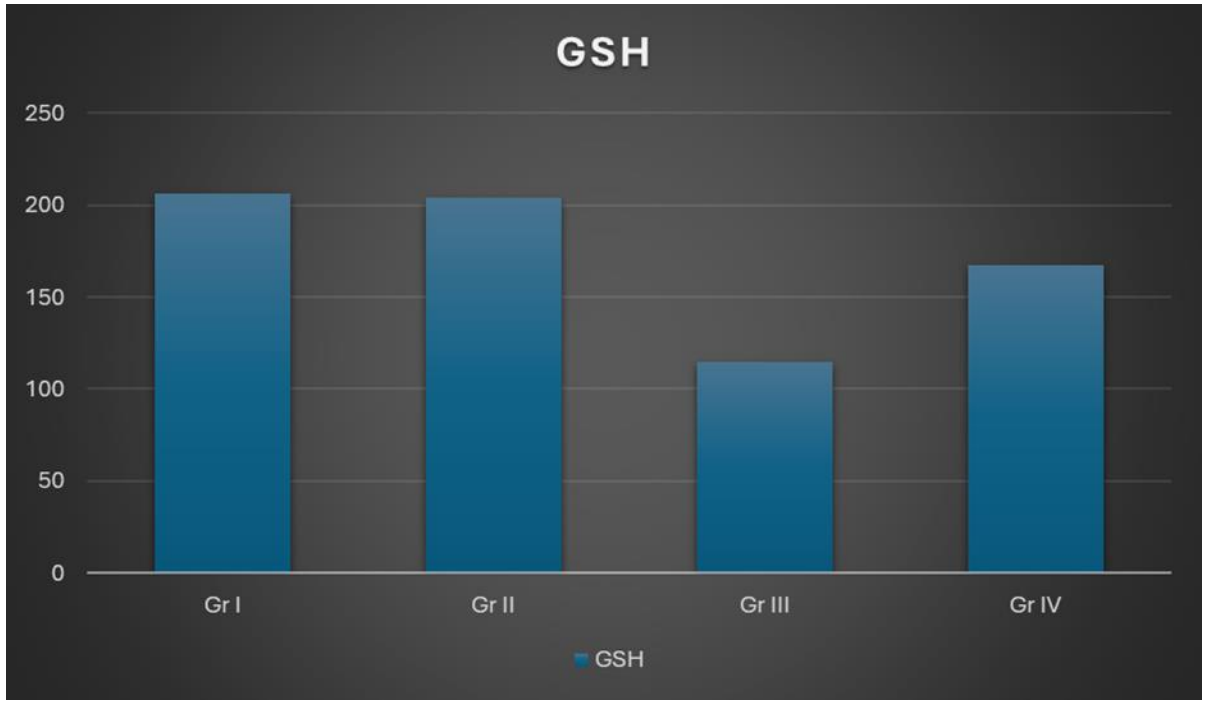
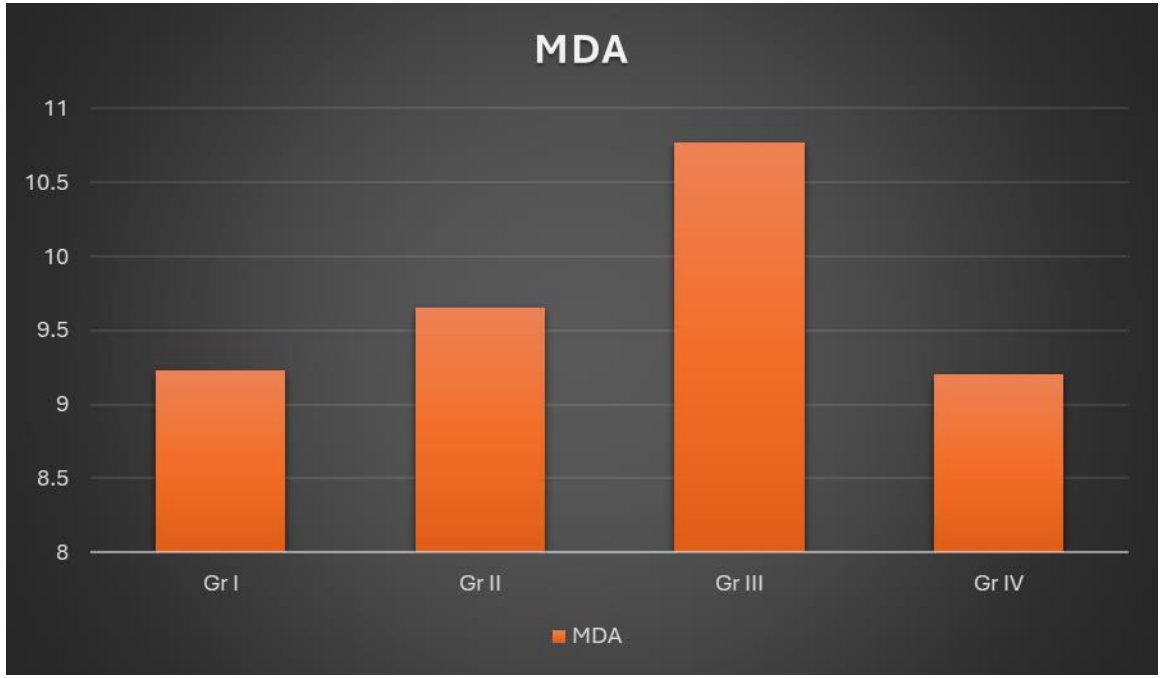


TABLE 2- TESTICULAR TISSUE LEVEL OF MDA

GROUPS	MDA (microgram/gm tissue)
GR I	9.23±0.17
GR II	9.65±0.34^{NS}
GR III	10.77±0.39*
GR IV	9.20±0.22^{NS}



Values are express as Mean±SEM. (n)=6.
P <0.05 is taken as significant.
NS (not significant) GR.I versus Gr.II & Gr. III versus Gr.IV
*P<0.05, Gr.I versus GR.III

- Significant ($p<0.05$) increase in the testicular tissue level of MDA in bisphenol treated group compared to normal control group.

- Treatment with Vitamin E showed a significant decrease in testicular MDA level (GR IV) compared to bisphenol intoxicated rats (GR III)

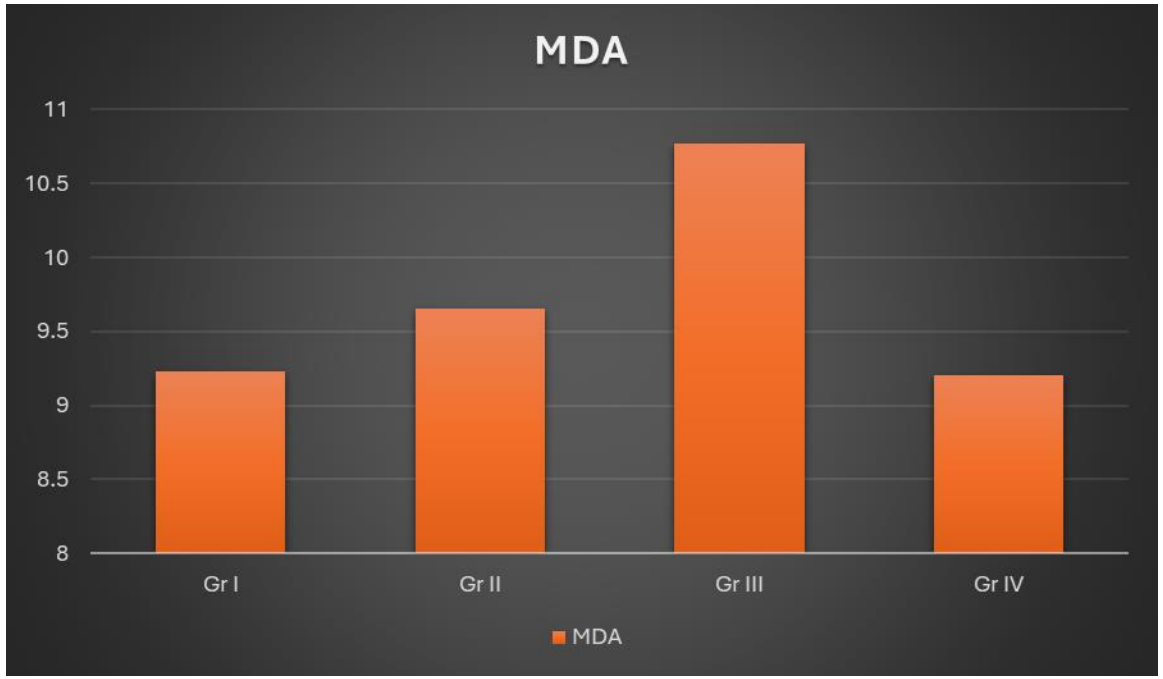
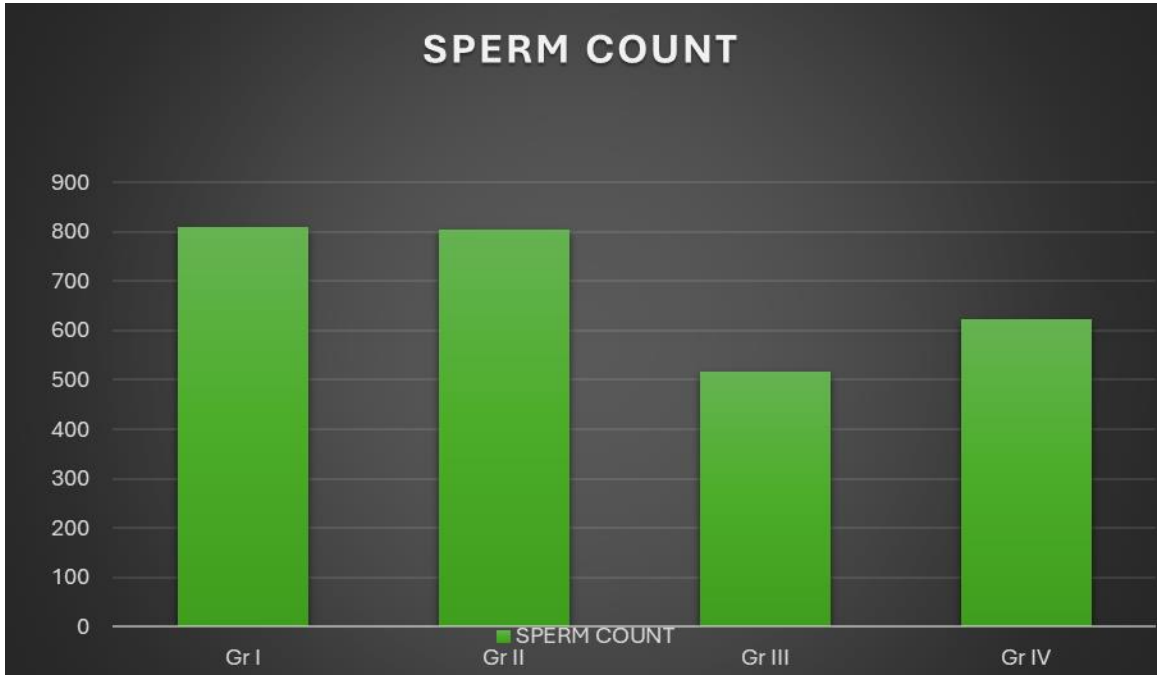


TABLE 3-TOTAL SPERM COUNT

GROUPS	SPERM COUNT
GR I	810.45± 5.47
GR II	804.24± 9.14^{NS}
GR III	516.74± 7.43***
GR IV	624.13± 2.88¶¶

Values are express as Mean±SEM. n=6
P <0.05 is taken as significant
NS(not significant) GR.I versus Gr.II .
***P<0.0001, GR.I versus GR.III
¶¶P<0.0003, GR.III versus Gr.IV



- Sperm count ($p<0.001$) was significantly low in bisphenol treated group compared to normal control group.

- Treatment with vitamin E in bisphenol intoxicated rats showed a significant increase ($p<0.0003$) in the sperm count compared to bisphenol intoxicated rats (GR III)

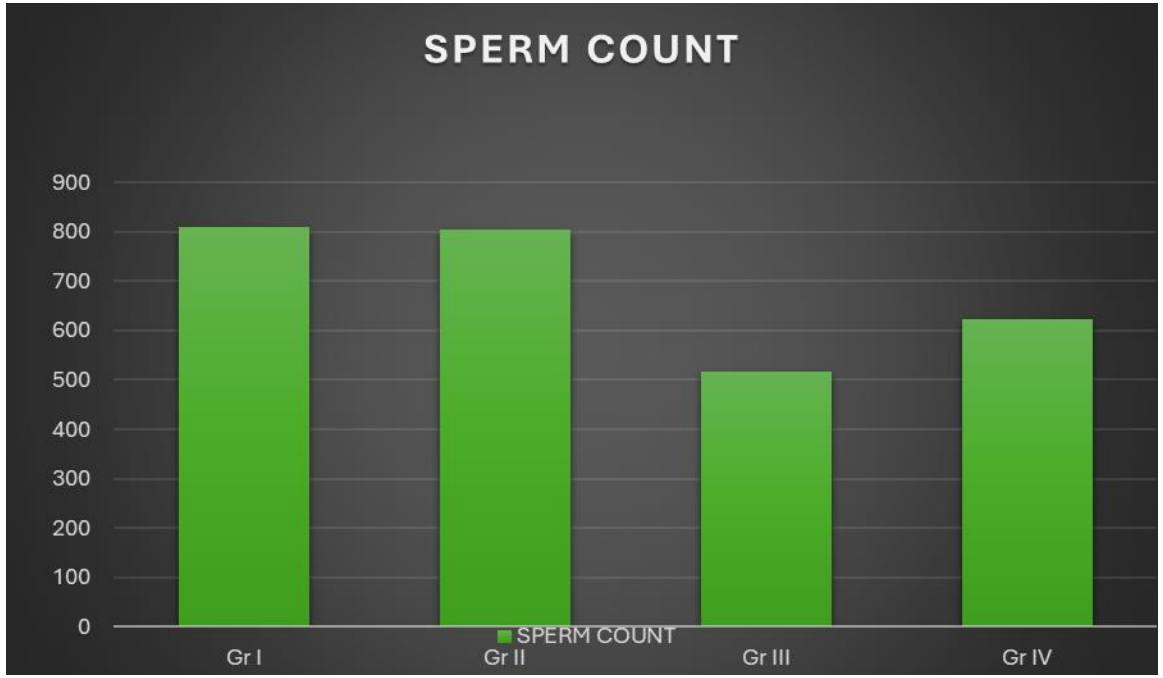
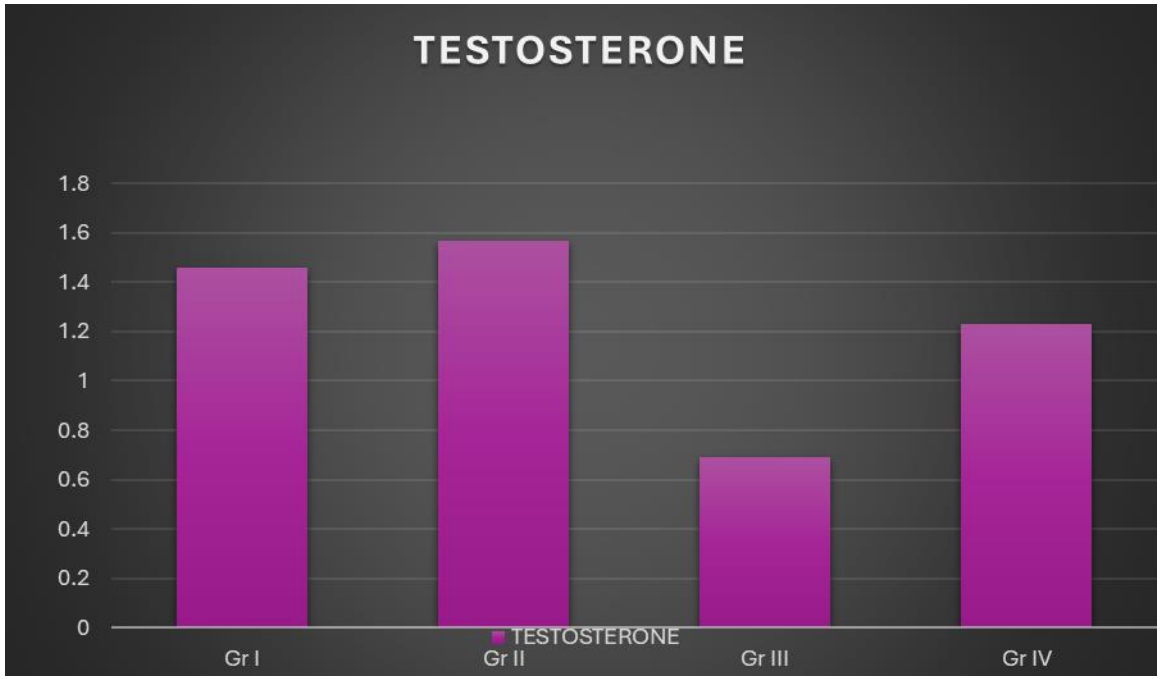


TABLE 4-TESTOSTERONE LEVELS

GROUPS	TESTOSTERONE (ng/ml)
GR I	1.46±0.62
GR II	1.57±0.12^{NS}
GR III	0.69±0.03***
GR IV	1.23±0.02¶¶¶

Values are express as Mean±SEM. n=6.
P <0.05 is taken as significant
NS(not significant) GR.I versus Gr.II .
***P<0.0001, GR.I versus GR.III
¶¶¶P<0.0001, GR.III versus Gr.IV



- Testosterone was significantly low in bisphenol treated group compared to normal control group.

- Treatment with vitamin E in bisphenol intoxicated rats showed a significant increase ($p<0.0003$) in the testosterone level compared to bisphenol intoxicated rats (GR III)

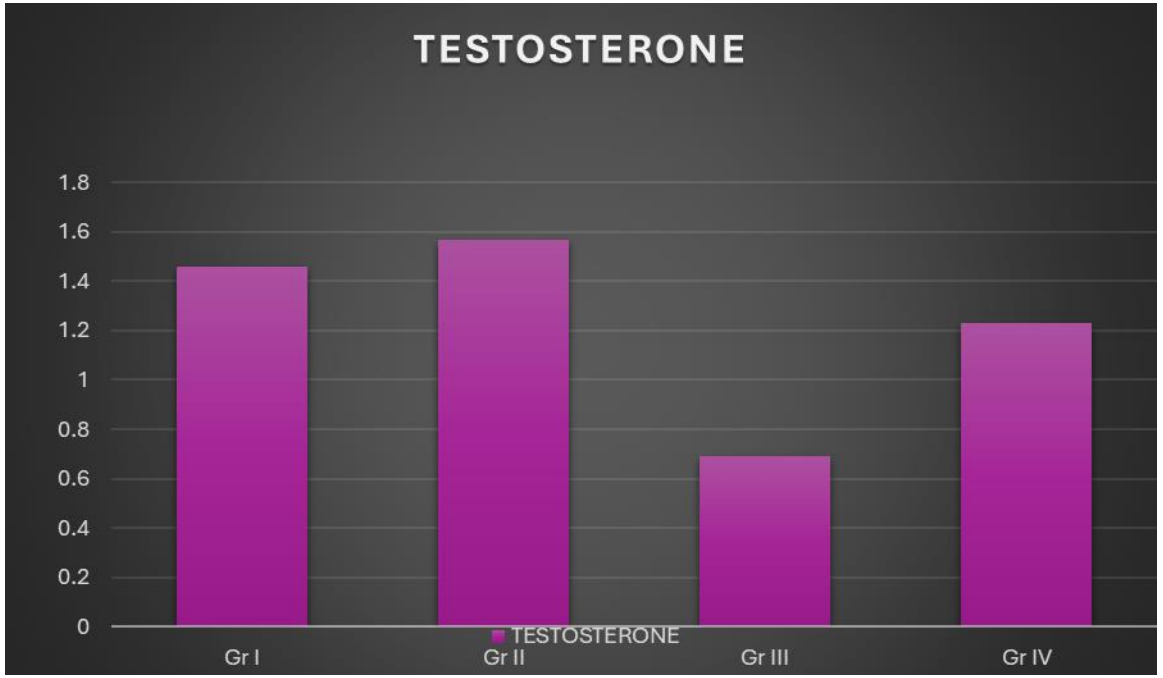


TABLE 5- SPERM SHAPE ABNORMALITIES

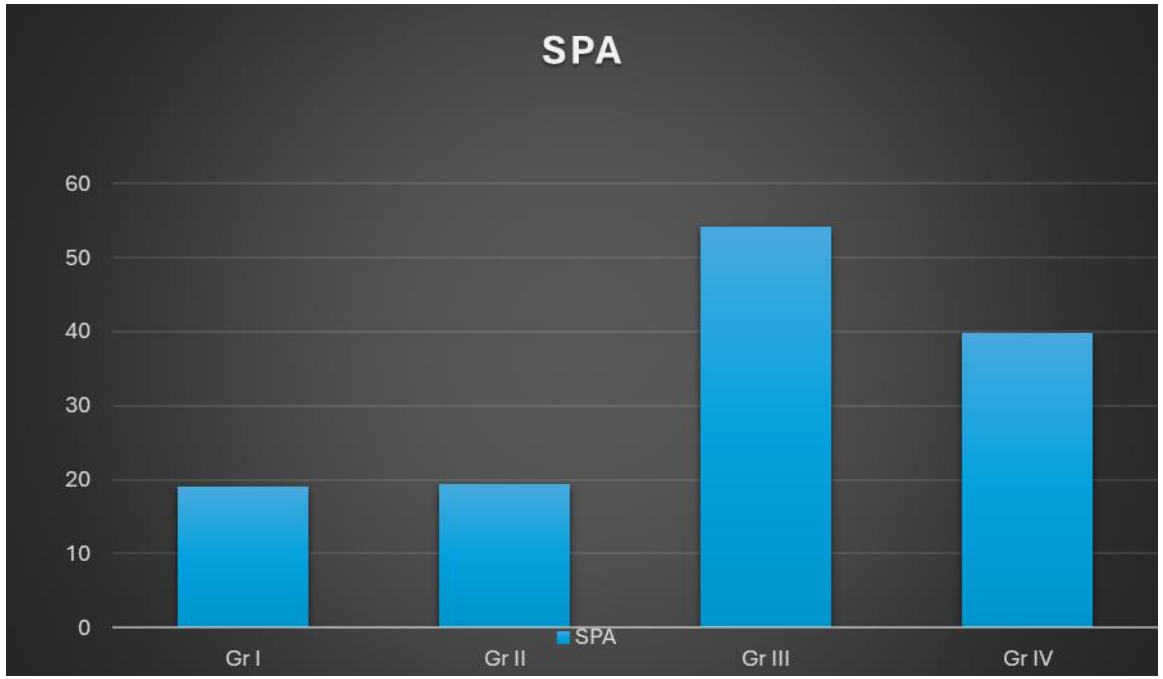
Groups	Normal	HA	TA	MC	CC	Total
Group I	187±3.22	9.83±0.75	8.83±0.75	0.5±1.22	5±0.40	19.06±2.82
Group II	184.26±3.48	9.83±0.75	9.33±1.03	0.83±1.16	1.1±1.09	19.33±3.46
Group III	134.4±1.33***	34.5±1.51	24.83±1.83	4.16±0.75	3.14±0.63	54.22±2.34***
Group IV	149.17±1.82¶¶¶	26.16±1.16	17.83±0.75	1.83±0.40	3.02±0.63	39.77±1.72¶¶¶

HA – Head abnormality, TA – Tail abnormality,
MC – Microcephaly ,CC – Cephalocaudal junction

Mean ± SEM, n=6 in each group.
***P<0.0001 , GR.I Versus Gr.III,
¶¶¶P<0.0001 Gr.III versus Gr.IV

- Bisphenol intoxicated rats (GR III) showed significant increase in total sperm shape abnormality compared to control groups ($P<0.001$).

- But a significant decrease in sperm shape abnormality was observed in rats treated with vitamin E.



HISTOLOGICAL RESULTS

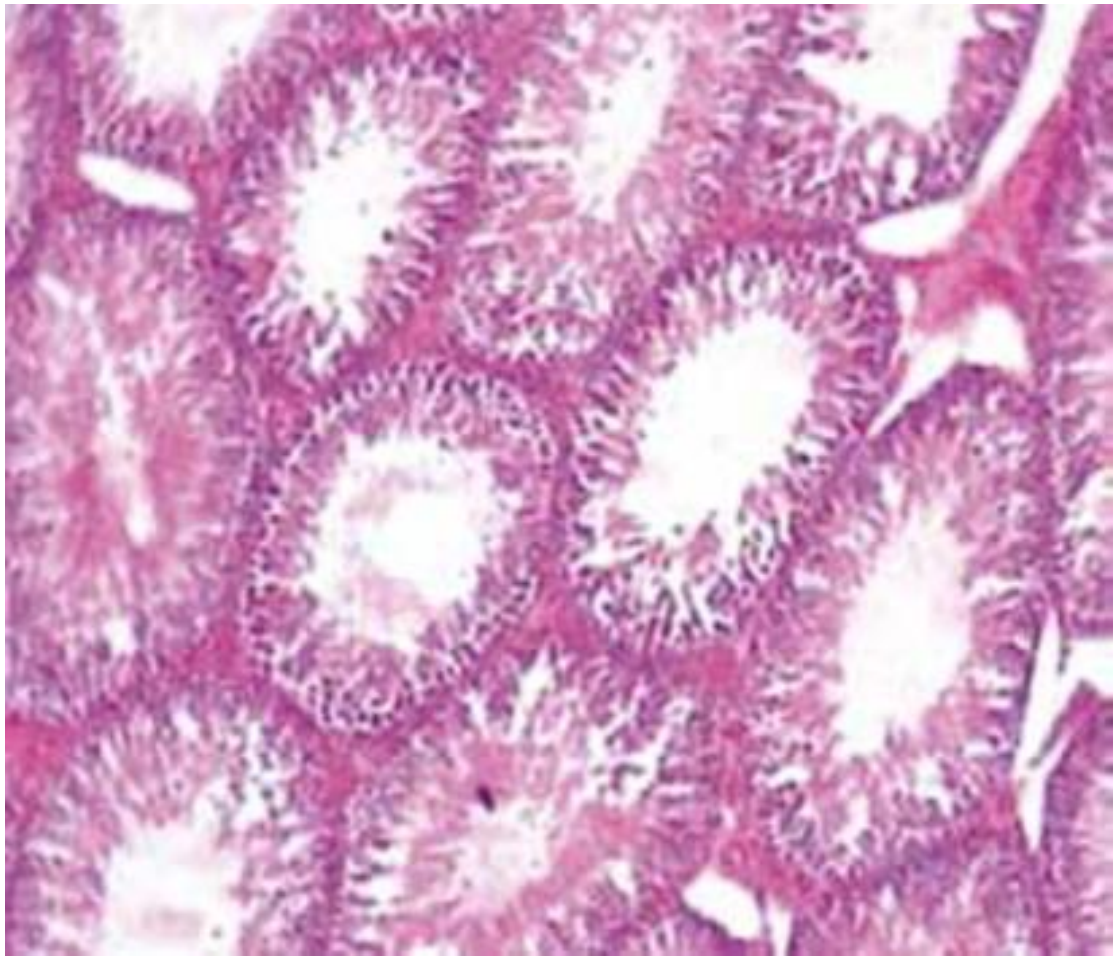


Fig.1.Photomicrograph of rat testis shows normal histological features in normal control group (Group I)

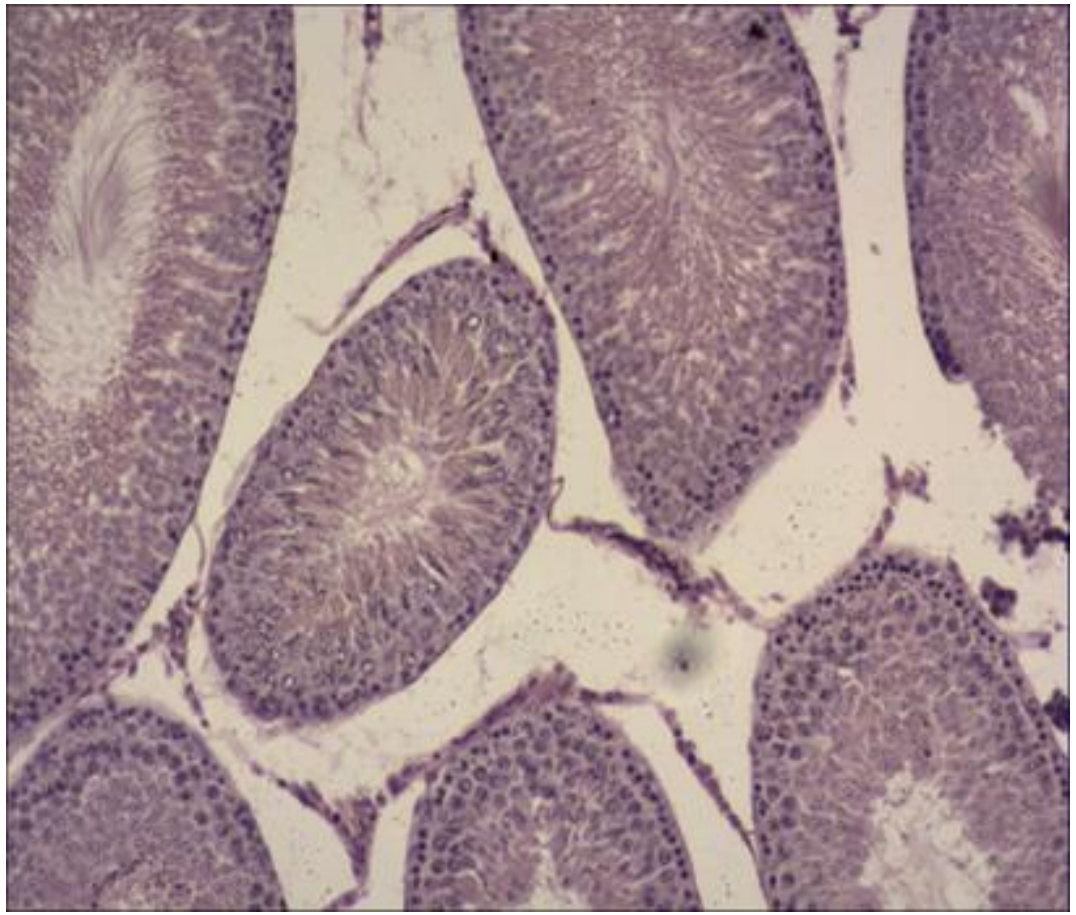


Fig. 2 Photomicrograph of rat testis shows normal histological features in vitamin E group (Group II)

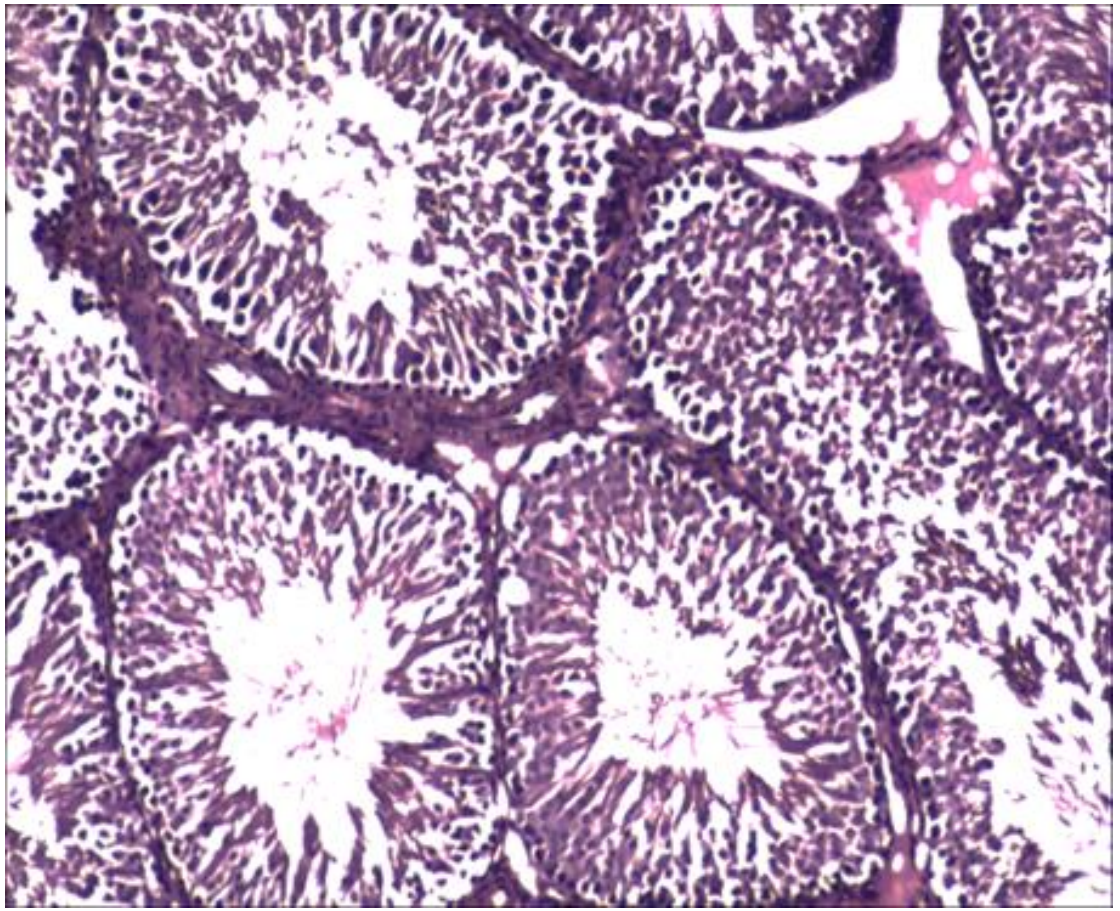


Figure 3: Photomicrograph shows some degenerative changes in the seminiferous tubule with significantly reduced of spermatozoa in rats treated with bisphenol (Gr.III)

Figure 4: Photomicrograph of rats testis shows no change is the normal architecture of the seminiferous tubule but the spermatogenesis is affected to a little extent (Gr. IV)

DISCUSSION

- The results of the present study showed that administration of bisphenol (25mg/kg bw/day) showed a significant decrease in the testicular tissue level of GSH and increase in MDA. This indicated the tissue damage induced by bisphenol.

- The results of the present study also showed an increase in sperm count, testosterone levels and a decrease in sperm shape abnormalities after administration of Vitamin E.

- These data agree with the previous studies which illustrated that treatment of rats with BPA increases levels of ROS production.

- Vitamin E has numerous important roles within the body because of its antioxidant activity.

- Our study also showed a protective role of Vitamin E in reducing bisphenol induced oxidative stress on testicular parameters of wistar rats.

CONCLUSION

The results of this study revealed that oral BPA administration induced adverse oxidative effects on the exposed animals and

Treatment with vitamin E provided a protective antioxidant role against such adverse effects.

REFERENCES

1. Barnham K.J., Masters C.L., Bush A.I. Neurodegenerative diseases and oxidative stress. Nat. Rev. Drug Discov. 2004;3(3):205–214.

2. Rubin B.S. Bisphenol A: an endocrine disruptor with widespread exposure and multiple effects. J. Steroid Biochem. Mol. Biol. 2011;127(1):27–34

3. Morgan A.M., El-Ballal S.S., El-Bialy B.E., El-Borai N.B. Studies on the potential protective effect of cinnamon against bisphenol A- and octylphenol-induced oxidative stress in male albino rats. Toxicol. Rep. 2014;1: 92–101.

4. Gonzalez-Parra E., Herrero J.A., Elewa U., Bosch R.J., Arduan A.O., Egido J. Bisphenol a in chronic kidney disease. Int. J. Nephrol. 2013;:43:7857.

5. Helal E, Badawi M, Soliman M et al. Physiological and Histopathological studies on Bisphenol-A compound as xenoestrogen in male albino rats. The Egyptian Journal of Hospital Medicine.2013; 50: 127 – 136.

6. K. Narayana, U.J.A. D'Souza, K.P.S. Rao.Effect of ribavirin on epididymal sperm count in rat, Indian J. Physiol. Pharmacol. 2002 ;46(1) :97–101.


thank you!