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Effect of carbendazim on the testis and kidney of male Swiss albino mice

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Abstract : *An experiment was conducted to investigate the effect of carbendazim on the structure of testis and Kidney of Swiss albino mice, and also to detect the possible ameliorative effect of L-ascorbic acid on carbendazim toxicity. The study revealed significant changes in the weight of testes in the group of mice treated with carbendazim +ascorbic acid (dissected after two days) as compared to Carbendazim treated group (dissected after five days). Histopathological changes caused by carbendazim were also observed in both testis and kidney. However mice pre-treated with ascorbic acid showed improvement in both the organs.*

Keywords : *Carbendazim, Ascorbic acid, Testes, Kidneys.*

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Introduction :

Carbendazim is a widely used broad spectrum fungicide. It is used to control fungal pathogen on cereals, fruits, cotton, tobacco, turf, ornamentals, vegetables, etc. It is also used in post-harvest food storage and as a pre-sowing seed treatment. In India, its trade name is Ruston-5 (Benefil and Bavistin). Carbendazim has foetotoxic and teratogenic effects. A study by Nakai et al (1992) has shown the acute and long term effect of a single dose of the fungicide carbendazim on male reproductive system in mice. Goldman et al (1989) studied the effect of carbendazim on the hypothalamic pituitary reproductive axis in the male rat.

Ascorbic acid has a therapeutic role. It plays an important role as antioxidant agent in the hepatic toxicity and prevents the effect of free radicals for vital cells (Sinsa et al 2008). Ascorbate can both chelate and reduce transition metal ions and in turn can reduce O_2 or H_2O_2 to super oxide and hydroxyl radicals respectively (Carr and Frei 1999). Selmanoglu et al (2001) treated male rats with Carbendazim for 15 weeks to see the effect on liver and kidney. Sakr et al (2011) had studied the effect of metalaxyl fungicide and the ameliorative effect of ginger on the kidney of Swiss Albino mice.

A study on the effect of oral exposure of carbendazim on Swiss albino mice and the possible protective role of ascorbic acid on carbendazim toxicity has not been done.This study was undertaken to see the effect of a single sublethal dose of carbendazim on the kidney and testis of Swiss albino mice and the possible amelioration caused by ascorbic acid.

Materials and Methods :

Forty eight inbred male Swiss albino mice with an average weight of 32±0.75gm were used for the experiment.The mice were procured from the animal house of Patna Women's College. They were housed in polypropylene cage in air conditioned room at 25±2ºC in 12hrs light-12 hrs dark cycles. They were fed on bengal gram, soybean and tap water.

The animals were divided into six groups (n=8 per group). First group was treated with 0.5ml olive oil and considered as control group. The second and third groups were fed with normal food and water, but administered with single high but sub-lethal dose of carbendazim (400mg/kg BW) suspended in 0.5ml olive oil. The fourth group was treated with a single high dose of 50mg/kg BW of L-ascorbic acid. According to Sahu and Das (1994), 10mg/Kg BW of ascorbic acid is quantitively equivalent to the human therapeutic dose (500 mg/day) in terms of body weight. The fifth and sixth groups were treated with 50mg/Kg BW of ascorbic acid followed by 400mg/Kg of carbendazim. The mice of second and fifth groups were sacrificed on the second day of dose after giving light anesthesia. Weight of testes and kidneys were taken. The remaining mice were sacrificed on the fifth day of dose after giving light anaesthesia. Weight of testes and kidneys were taken.

Results and Discussion :

There was no change in general and feeding behavior of mice treated with carbendazim. There was no significant change in the initial and final body weights of the treated mice, but there was a slight fall in the final weight of the control group of mice treated with ascorbic acid ($t=2.09, P<0.05$) (Table 1). There was no significant change in the weights of kidneys between carbendazim treated group and carbendazim + ascorbic acid treated group of mice and no significant change was seen in the weights of kidneys between the control and treated groups of mice dissected after two days as well as after five days (Table 2). However, a significant increase in the weight of testes was observed in carbendazim + ascorbic acid treated group of mice (dissected after two days) as compared to carbendazim treated group (dissected after five days) ($t=1.96, P<0.05$) and a significant difference was seen the weights of testes between the control and treated groups of mice dissected after two days as well as after five days (Table 3).

Testes of control group of mice or those given only ascorbic acid showed normal structure. The seminiferous tubules are lined by regularly arranged rows of spermatogenic cells in different stages of maturation. (Fig 1 and 3) whereas, testes of mice treated with carbendazim displayed many histopathological alterations such as sloughing of seminiferous epithelium, pycnotic nuclei, degeneration of blood vessel endothelium, infiltration of lymphocytes (Fig 2). Mice treated with carbendazim and ascorbic acid revealed that the seminiferous epithelium restored its normal structure and most cells displayed a certain degree of recovery (Fig. 4).

The kidney of control mice and mice treated with only ascorbic acid showed normal structure of glomerulus and renal tubule (Fig 5 and 7). Examination of the kidney sections of mice treated with carbendazim showed histopathological changes such as shrinkage of glomeruli and degeneration of cells lining the kidney tubules (Fig 6). Administration of ascorbic acid improved testicular damage induced by carbendazim as shown by increase of spermatogenic cells. The curative effect of ascorbic acid against testicular damage induced by carbendazim may be due to its antioxidant properties. The results of the present study showed that pre-treatment of animals with ascorbic acid before the dose of carbendazim improved the histopathological changes induced in the kidney by carbendazim.

Table 1. Comparison of initial and final body weights of mice. (Values are Mean ± S.E.)

	Initial Weight	Final weight	t value	Level of significance
Control with olive oil	27.57 ± 0.71	28.49 ± 0.85	0.84	NS
Treated with Carbendazim (dissected after two days)	27.92 ± 0.89	27.90 ± 0.92	0.01	NS
Treated with Carbendazim (dissected after five days)	31.03 ± 0.61	28.98 ± 1.71	1.55	NS
Control with ascorbic acid	32.14 ± 0.61	30.24 ± 0.67	2.09	P < 0.05
Treated with Carbendazim + ascorbic acid (dissected after two days)	28.91 ± 0.86	28.91 ± 0.84	0.01	NS
Treated with Carbendazim + ascorbic acid (dissected after five days)	28.07 ± 0.87	29.97 ± 0.92	1.49	NS

Table 2. Comparison of weights (in gms) of Kidneys (left + right) between carbendazim treated and carbendazim + ascorbic acid treated mice . (Values are Mean ± S.E.)

	Control	Treated with Carbendazim (dissected after two days)	Treated with Carbendazim (dissected after five days)	F value	Level of significance
Carbendazim treated	0.55 ± 0.03	0.51 ± 0.03	0.49 ± 0.03	1.190714	NS
Carbendazim with ascorbic acid	0.51 ± 0.03	0.53 ± 0.03	0.48 ± 0.03	0.986541	NS

Table 3. Comparison of weights (in gms) of testes (left + right) between carbendazim treated and Carbendazim + ascorbic acid treated mice.(Values are Mean ± S.E.)

	Control	Treated with Carbendazim (dissected after two days)	Treated with Carbendazim (dissected after five days)	F value	Level of significance
Carbendazim treated	0.24 ± 0.02	0.24 ± 0.01	0.25 ± 0.02	0.249787	NS
Carbendazim with ascorbic acid	0.25 ± 0.02	0.27 ± 0.01	0.24 ± 0.02	4.868512	P < 0.05

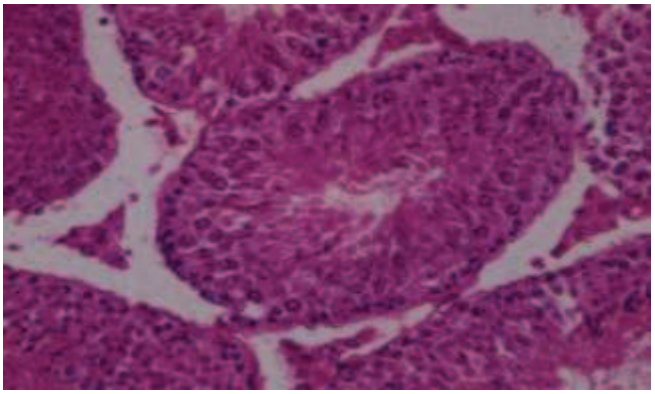

Fig 1. Testis of control group of mice showing normal seminiferous tubules with regularly arranged rows of spermatogenic cells in different stages of maturation. (Magnification = X 400)

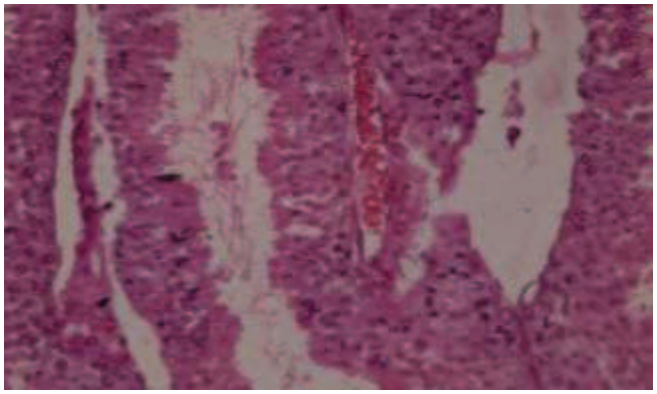

Fig 2. Testis of mice treated with carbendazim showing vacuoles in Sertoli cells, congestion in interstitial tissue, severe necrosis in seminiferous tubules, clumped Spermatozoa. (Magnification = X 400)

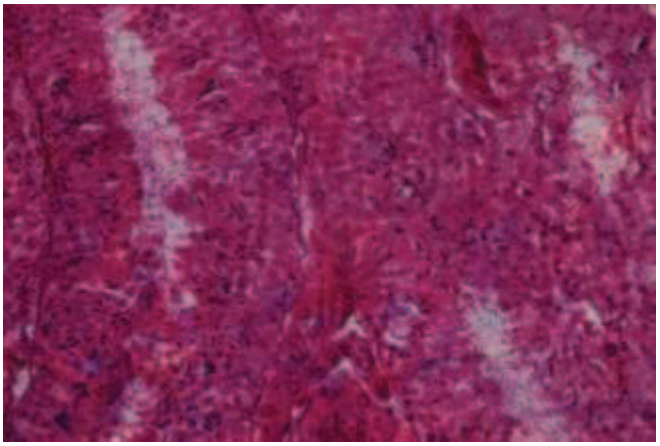

Fig 3. Testis of mice treated with ascorbic acid. The height of seminiferous epithelium appears normal and Interstitial cells appear normal (Magnification = X 400)

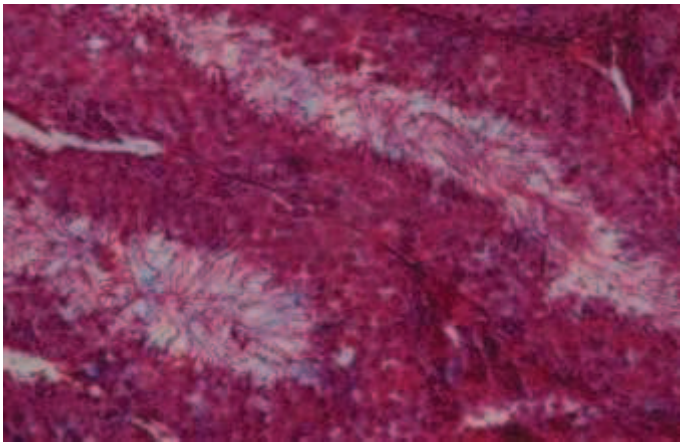

Fig 4. Testis of mice treated with ascorbic acid carbendazim. Seminiferous epithelium and spermatozoa appear normal compared to carbendazim treated group treated group. (Magnification = X 400)

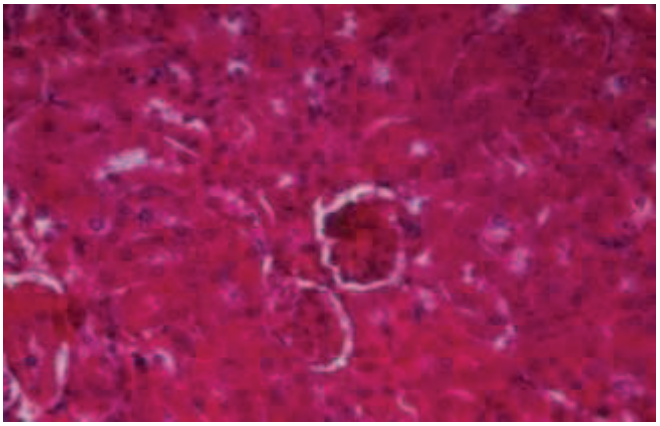

Fig 5. Kidney of control group of mice showing normal glomerulus and kidney tubular cells. (Magnification = X 400)

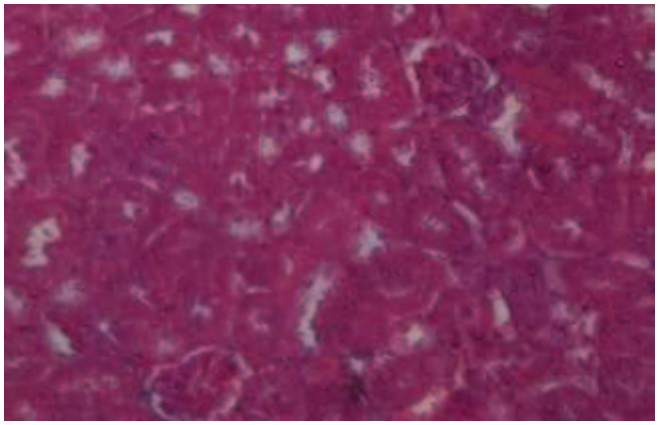

Fig 6. Kidney of mice treated with carbendazim showing degeneration of cells and shrinkage of glomerulus. (Magnification = X 400)

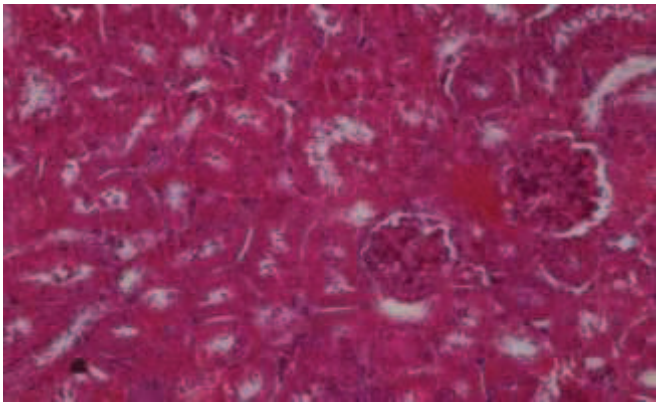

Fig 7. Kidney of mice treated with ascorbic acid showing normal glomeruli and renal tubule. (Magnification = X 400)

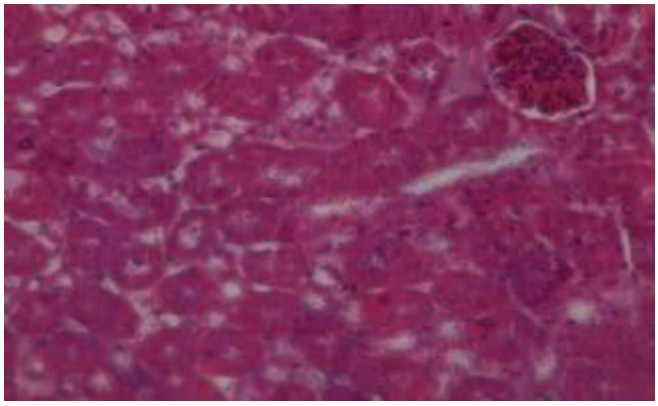

Fig 8. Kidney of mice treated with Ascorbic acid and carbendazim showing normal proximal tubule (PT) and glomerulus. (Magnification =X 400)

Conclusion :

On the basis of significant histopathological changes on testis and kidney observed in our research, it is concluded, that even a single sub-lethal doze of carbendazim has a direct toxic effect on the testis as well as on kidney.

Ascorbic acid may help in ameliorating the toxic effect of Carbendazim.

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References :

Carr A and Frei B. (1999). Does vitamin C act as a pro-oxidant under physiological conditions? *FASEB J.* 13:1007-1024.

Goldman J M, Rehnberg G L, Cooper, R L, Gray L E Jr, Vein J F and Mc Elroy W K (1989). Effect of the benomyl metabolite, Carbendazim, on the hypothalamic – pituitary reproductive axis in the male rat. *Toxicology.* 57:173-182.

Nakai M, Hess R A, Moore B J, Gutteroff R F, Strader L F and Linder R E (1992). Acute and long-term effects of a single dose of the fungicide carbendazim (methyl 2-benzimidazole carbarnate) on the male reproductive system in the rat. *J. Androl.* 13:507-518.

Sahu K and Das R K (1994). Reduction of clastogenic effect of clofazimine, an antileprosy drug , by vitamin A and vitamin C. In bone marrow cells of mice. *Fd Chem. Toxicol*. 32:911-915.

Sakr S A, Lamfon H A and Essawy A E (2011).Ginger (Zingiber officinate) extract ameliorates metalaxyl fungicide induced nephrotoxicity in albino mice, *African J Pharmacy Pharmacol* 5:104-112.

Selmanoglu G, Barlas N, Songür S and Koçkaya E A (2001). Carbendazim induced haematological, biochemical and histopathological changes to the liver and kidney of male rats. *Hum. Exp. Toxicol*. 20:625-630.

Sinsa F D, Gordana C, Jelena D and Vukosava D (2008). The influence of vitamin C supplements on the oxidative status of interscapula brown adipose tissue. *Journal of Thermal Biology.* 33:238-243.