Histology of Cadmium Intoxicated Mice Liver following Speman Therapy

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INTRODUCTION
A trial was made to protect mice testes, epididymis and adrenal glands with Speman (The Himalaya Drug Company) against cadmium toxicity, as cadmium damages them (Gunn and Gould, 1970) and interestingly enough it was discovered that Speman gave encouraging results (Rathore and Saraswat, 1986). Actually cadmium primarily accumulates in the liver and kidney, hence it was felt worth looking at the liver to find out the possible mode of action of Speman in reducing cadmium toxicity.

MATERIALS AND METHODS
Three and half month old albino Swiss male mice were obtained from the Biological Products Division, Veterinary College, Mhow (M.P.) and were used in the present experiments. 10 mice were placed in each propylene cage (290 x 220 x 140 mm) and given standard mice food and tap water ad libitum. Cadmium chloride (CdCl$_2$) of BDH was dissolved in distilled water to prepare a solution of 1 mg/ml.

Each Speman tablet contains the following:

- **Orchis mascula**: 65 mg
- **Lactuca scariola**: 16 mg
- **Hygrophila spinosa**: 32 mg
- **Mucuna pruriens**: 16 mg
- Exts. **Parmelia perlata**: 16 mg
- **Argyreia speciosa**: 32 mg
- **Tribulus terrestris**: 32 mg
- **Leptadenia reticulata**: 32 mg
- **Suvarnavang (Mosaic Gold)**: 16 mg

Speman is not soluble in water hence The Himalaya Drug Company supplied a suspension having 10 mg/ml Speman, which was administered orally through injection using a blunt needle. The mice were divided into three groups:

I. **Group A**: All mice received a single injection of 1 mg CdCl$_2$ + placebo given orally daily (1 ml).

II. **Group B**: All mice received a single injection of 1 mg CdCl$_2$ + 1 ml suspension containing 10 mg Speman daily.

III. **Group C**: Controls, no treatment at all.
The contents of Speman suspension were as follows:

- Speman powder (200 mesh) 100 gm
- Nipagin Sodium (0.25%) 2.5 gm
- Nipasol Sodium (0.15%) 10 gm
- Distilled water to make up 1000 ml

Placebo contained the same constituents as cited above except Speman.

The above mentioned experiment was conducted for 60 days. The mice were killed on the 61st day. Their livers were removed and fixed in alcoholic Bouin’s fluid and routine microtome sections of 6 to 8 microns were cut and stained in Delafield’s haematoxylin and eosin. The experiment was done thrice. Observations of permanent slides and camera lucida drawings have formed the basis of the present results.

RESULTS

It is clear from Table 1 that the diameter of the hepatocytes, i.e. cellular diameter, is reduced significantly following cadmium intoxication by about 37%. Speman therapy for 60 days brings about normal values for the diameter of the hepatic cells.

No significant change is observed in the diameter of the nuclei in the liver cells following either cadmium or Speman therapy as compared with the controls.

| Table 1: Effect of cadmium chloride and Speman therapy on mice liver cells after cadmium chloride intoxication |
|--------------------------------------------------|-----------------|-----------------|
| Treatment                                      | Autopsy (day)  | Diameter in microns (Mean ± SE) |
|                                                  |                 | Nuclear Celluar |
| Control (Vehicle)                               | 60 (10)         | 8.48 ± 1.13     | 19.77 ± 0.46     |
| 1 mg CdCl₂ (Single injection) + Placebo        | 60 (10)         | 5.93 ± 1.33     | 12.44 ± 0.44*    |
| 1 mg CdCl₂ (Single injection) + Speman (10 mg daily orally) | 60 (10)         | 7.86 ± 1.04     | 21.93 ± 1.44     |

*Significantly different from controls at p<0.05.
Figures in parentheses indicate the number of animals used.

DISCUSSION

A careful perusal of Table 1 reveals that cadmium caused shrinkage of the hepatocytes. Earlier workers have already found cadmium-induced cirrhosis of the liver (Webb, 1972; Schroeder et al., 1965), fibrous tissue proliferation (Wilson et al., 1941) and increased smooth endoplasmic reticulum (Stowe et al., 1972). In fact cadmium binds with a protein (metallothionein) in hepatocytes and this bound cadmium in turn lowers the detoxification power of the liver. Raymonds et al. (1976) reported 78% inhibition in the activity of hepatic demethylation following cadmium treatment.

Cadmium is known to interfere in the synthesis of testosterone in fish (Sanglang and O’Hallaran, 1973) and in rats (Saxena et al., 1977). Speman is a non-steroidal compound, which does not effect serum LH, FSH and prolactin (Jayatilak et al., 1976a). Its action on mice testes, epididymis and adrenals seems direct, as Speman possesses a distinct, androgen-
like activity (Subbarao et al., 1974; Jayatilak et al., 1976b). In the present investigation, where the liver cells appear normal with Speman treatment (37% shrinkage was nullified), it would appear that Speman might have had a direct beneficial effect on the testes and epididymis as reported by Rathore and Saraswat (1986), because cadmium must have lowered the testosterone level. Furthermore, the appearance of normal liver cells after Speman therapy confirms that this non-steroidal compound has no toxic effect on the liver, which was likely to occur following a single large dose or small doses over longer periods of testosterone injections which are known to damage the liver (Goodman and Gilman, 1970) and disturb lipoprotein metabolism (de Kretser, 1974).

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REFERENCES


