

Effect of Liv.52 on Blood Sugar in Beryllium Nitrate-Exposed Rats

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ABSTRACT

Administration of beryllium nitrate in rats caused severe liver damage, severely lowering blood sugar levels. With Liv.52 treatment, the liver damage was reduced and the liver showed significant improvement.

The administration of Liv.52 syrup to beryllium-exposed rats tended to maintain blood sugar at levels considerably higher than those in untreated animals.

INTRODUCTION

The toxic effects of beryllium on laboratory animals and humans are well known¹⁻⁴. Aldridge and coworkers⁵ studied the mode of its toxic action in rats and rabbits and found that the immediate cause of the death was lowering of blood sugar and liver damage. An Ayurvedic drug, Liv.52 (The Himalaya Drug Company, Bombay) which is used clinically in various liver disorders⁶⁻⁹, has also been reported to increase the protective index in beryllium-treated rats¹⁰. The present investigation, therefore, deals with the effect of oral administration of Liv.52 on the blood sugar and histopathology of the liver in beryllium nitrate-exposed rats.

MATERIALS AND METHODS

Adult albino rats (150 ± 10 g) of Sprague Dawley strain were selected from the rat colony of our department. All the rats were maintained under uniform husbandry conditions of light and temperature, and were given pelleted diet (Hindustan Lever, Bombay) and water *ad libitum*. Beryllium nitrate was dissolved at a concentration of 0.316 mg/ml in pyrogen-free distilled water and was injected to the experimental animals intravenously once only at a dose of 0.316 mg/kg body weight (1/10th of LD₅₀)¹¹. This dose of beryllium nitrate was toxic in pregnant rats¹² and, therefore, selected for further studies.

Liv.52 syrup (obtained from The Himalaya Drug Company, Bombay) contained the extracts of *Capparis spinosa*, *Cichorium intybus*, *Solanum nigrum*, *Cassia occidentalis*, *Terminalia arjuna*, *Achillea millefolium* and *Tamarix gallica*.

The selected animals were divided into four groups of ten each and were treated as follows:

- Group 1: Animals were given vehicle only;
- Group 2: Animals were primed with Liv.52 for 10 days prior to the experiment and thereafter received Liv.52 daily till the 15th day of experimentation;
- Group 3: Animals were first primed with Liv.52 for 10 days as in Group 2 and then were exposed to beryllium nitrate once at 0.316 mg/kg dose (intravenously). This time was designated as zero hr. Simultaneously these animals received daily doses of Liv.52 till the 15th day of experimentation.

Group 4: Animals were administered beryllium nitrate intravenously once at a dose of 0.316 mg/kg and the time was designated as zero hour.

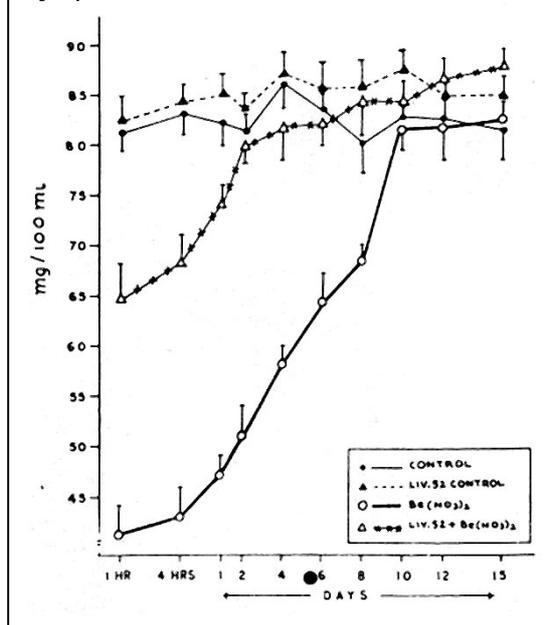
The blood samples were collected from each rat at different time intervals ranging from 1 hr to 15 days by puncture of the retro-orbital venous sinus and each sample was processed for the estimation of sugar using the method of Asattor and King. The results were analyzed statistically. Simultaneously, liver pieces were taken out, and fixed in Bouin's fluid for histopathological studies.

OBSERVATIONS

The blood sugar levels of the control rats remained almost static during 15 days (Fig.1). Liv.52 *per se*, when given to Group 2 rats, showed no significant change in blood sugar levels as compared to the control rats. The administration of beryllium nitrate at a dose of 0.316 mg/kg body weight intravenously decreased the level of blood sugar significantly and maximum decrease was observed after one hour of injection: and then the level recouped gradually and became equal to that of Group 2 after 10 days. When beryllium nitrate was administered to Liv.52 primed animals (Group 4), the sugar levels remained significantly high even after 1 hour of its administration when compared to Group 3; however, these values are significantly lower when compared to rats of Group 2 (Liv.52 primed). Within 2 days, the blood sugar levels of Group 4 became almost equal to those of Group 2.

Histopathological examination of the livers of beryllium-treated rats revealed severe pathological changes, which were overcome by giving Liv.52 treatment. Figure 2 reveals that after 2 days of beryllium nitrate administration, although the chord arrangements of hepatocytes were maintained, they showed preneurotic changes at places distant from the hepatic vein. On the contrary, its parallel control, which received Liv.52, also showed completely normal histological structures in the liver (Figure 3). After 10-15 days of beryllium administration the liver was still in a damaged condition. The arteries showed damage and congestion, and severe cytoplasmic vacuolations and pyknotic nuclei were also present (Figures 4 and 5). In contrast to this the liver of Liv.52 treated rats was free of such manifestation (Figures 6 and 7) and showed significant regeneration throughout the section, though minor granulation and damage were present.

Fig. 1: Effect of beryllium nitrate on the blood sugar levels in adult rats primed with Liv.52 syrup.



Lowering of blood sugar after the administration of beryllium salts, reported earlier⁵, has been described due to the disturbances in carbohydrate metabolism accompanied by liver damage^{15,16}. Beryllium administration also inhibits hexokinase in the liver¹⁷.

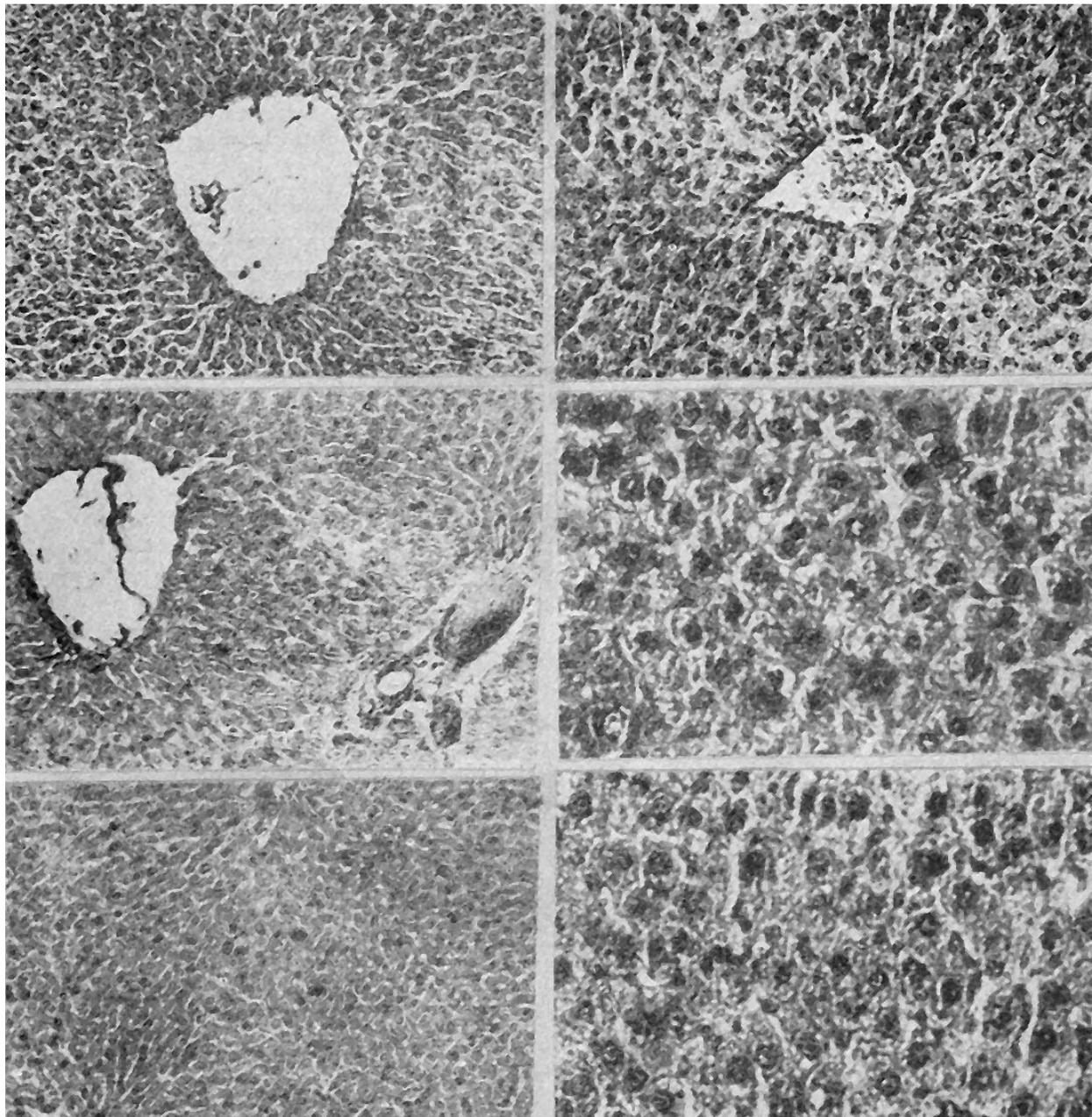


Fig. 2-7:

2. Photomicrograph of liver at 2 days after beryllium exposure showing pre-necrotic changes at distant places from the hepatic vein (x 120).
 3. Liver of rat showing normal histoarchitecture with Liv.52 treatment after 2 days of beryllium exposure (x 120).
 4. Liver of rat after 10 days of beryllium nitrate administration showing congestion and damage in hepatic artery, hepatocytes and nuclei (x 120).
 5. Cytoplasmic vacuolation and severe damage in liver histoarchitecture after 10 days of beryllium administration (x 400).
 6. Liver of rat showing improvement with Liv.52 treatment after 10 days of beryllium administration.
 7. Figure of rat liver showing slight damage and granulation in hepatocytes after Liv.52 and beryllium nitrate treatment.
- (1st row – Figs. 2 and 3; 2nd row – Figs. 4 and 5; 3rd row – Figs. 6 and 7)

CONCLUSIONS

Liv.52 is known to correct liver dysfunctions and ailments in many chronic liver diseases⁶⁻⁹. It is interesting to note from the present findings that the administration of Liv.52 syrup to beryllium-exposed rats tended to maintain blood sugar at levels considerably higher than in untreated animals. Administration of beryllium nitrate *per se* caused severe liver damage, including increase in the

peripheral parenchyma, disturbed nuclei, hepatocytes and hepatic vascularity. With Liv.52 treatment, the liver damage was reduced and it showed significant improvement. Although the exact mode of the protective action of Liv.52 against beryllium toxicity is yet to be elucidated, it seems worthwhile to search out and define those mechanisms that may be involved.

ACKNOWLEDGEMENTS

This work was supported by the CSIR and Ministry of Defence, New Delhi. The authors are thankful to Dr. P.K. Ramachandran, Director, DRDE, Gwalior and Dr. J. Bahadur, Professor and Head, for providing facilities.

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