PROTECTIVE EFFECT OF LIV-52 AGAINST BERYLLIUM TOXICITY IN RATS

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ABSTRACT

Lethal doses (LD_{50}) of beryllium nitrate and beryllium sulphate have been measured in rats already primed with Liv-52, an Ayurvedic drug, to assess its protective property. Our results revealed that Liv-52 increased the LD_{50} of beryllium salts in rats by many folds and thus induced a significant protective index (PI).

INTRODUCTION

THE toxicity of beryllium salts is well known in laboratory animals and human beings[1, 2]. While extracting and processing beryllium metal from its ores, workers in the mines and industries are constantly exposed to its toxic effects. Lethal doses (LD_{50}) of some ionized beryllium salts have been measured in rats, mice and other laboratory animals through various routes[3-5]. It has also been reported that the toxic action of beryllium is primarily due to the liver damage and disturbance in carbohydrate metabolism[6]. In order to develop a prophylactic against beryllium toxicity, some of the approaches like steroid therapy[7] and aurintricarboxylic acid[8] (ATA) have been tried but these did not prove successful. An Ayurvedic drug Liv-52 (Himalaya Drugs Company, Bombay) is known to correct the liver function in the condition of acute hepatitis[9] and also used to stimulate hepatic function in many chronic liver diseases[10]. Keeping in view the liver protective action of Liv-52, an attempt has been made in the present study to determine the lethal dose of beryllium salts in rats primed with Liv-52 and to evaluate its protective index (PI).

MATERIALS AND METHODS

Different doses of beryllium nitrate and beryllium sulphate were prepared in sterilized pyrogen-free distilled water as suggested by Horn[11] for lethal dose determination.

Liv-52 syrup was obtained from Himalaya Drugs Company, Bombay, India. It contains the extracts of *Capparis spinosa, Cichorium intybus, Solanum nigrum, Cassia occidentalis, Terminalia arjuna, Achilla millefolium, Tamarix gallica.* (but does not contain selenium, conventional SH compounds or chelating agents).

Healthy adult Swiss female albino rats (150 ± 10 g) were selected from the animal colony of the department. All the animals were divided into 4 groups, maintained under uniform condition of light, temperature and were given 'Hindustan Lever' pelleted diet and water *ad libitum*. Animals of group 1 and 3 were kept as such and received distilled water as vehicle only, whereas rats of groups 2 and 4 were primed with Liv-52 for 15 day (1 ml/rat/day orally) prior to initiating the experiments. These animals were then given different treatments (table 1). Animals of groups 1 and 2 were injected with beryllium nitrate and those of groups 3 and 4 were injected with beryllium sulphate respectively. Furthermore, the animals of groups 2 and 4 continued to receive Liv-52 syrup daily whereas those of groups 1 and 3 received vehicle only. The animals were left in the cages and observed for 7 days for mortality. Lethal dose (LD_{50}) was determined by the method of Horn[11] using five animals in a single set. The calculated LD_{50} in term of mg/kg was also converted into mg/m^2 as suggested by Prieur *et al*[12]. The protective index (PI) was calculated by the following formula:

$$PI = \frac{LD_{50} \text{ of beryllium salt with Liv-52}}{LD_{50} \text{ of beryllium salt alone.}}$$

RESULTS AND DISCUSSION

Table 1 shows the LD_{50} of beryllium nitrate to be 3.16 mg/kg body weight in intact rats. It increased to 20 mg/kg body weight in rats primed with Liv-52 for 15 days before exposure to beryllium nitrate. Similarly, the LD_{50} of beryllium sulphate increased from 4.30 mg/kg to 31.60 mg/kg body weight when the rats were primed with Liv-52 for 15 days. These observations clearly indicate that the lethal doses (LD_{50}) of beryllium nitrate and sulphate increased by many folds with Liv-52 syrup when expressed in terms of body surface area (mg/m^2)[13]. Ten mg dose seems to be critical because with both the salts a complete reversal

Table 1 *Lethal dose (LD_{50}) of some beryllium compounds in rats primed with Liv-52*

Group No.	Treatment	Dose* mg/kg	No. of rats died/No. of rats used	Lethal dose (LD_{50}) mg/kg (Confidence limits)	Lethal dose (LD_{50}) mg/m^2***	Protective index (PI)
1.	Beryllium nitrate (*i.v.*)	1.00	0/5	3.160 (1.86–5.38)	21.60	–
		2.15	2/5			
		4.64	3/5			
		10.00	0/5			
2.	Beryllium nitrate (*i.v.*) + Liv-52 (Oral)**	4.64	0/5	20.00 (13.70–29.10)	102.60	5.55
		10.00	5/5			
		21.50	3/5			
		46.40	5/5			
3.	Beryllium sulphate (*i.v.*)	1.00	0/5	4.300 (2.65–6.98)	25.80	–
		2.15	1/5			
		4.64	2/5			
		10.00	0/5			
4.	Beryllium sulphate (*i.v.*) + Liv-52 (Oral)**	10.00	5/5	31.60 (20.50–48.80)	189.60	7.34
		21.50	1/5			
		46.40	4/5			
		100.00	5/5			

* Dose have been selected according to the method of Horn[11] and LD_{50} was calculated using five animals per dosage level and a series of dosages corresponding to $3\sqrt{10}$.

** Liv-52 (1 ml/rat/day) was administered orally for 15 days (primed) and then beryllium salts were injected intravenously only once.

*** Expression in the term of body surface area (mg/m^2) Freireich *et al*[13] mg/kg dose × S (S is species factor which is 6 in rats).

of lethality is obtained by priming the animals with Liv-52.

The cause of toxic action of beryllium has been studied by a number of workers. It has been described that the immediate cause of death is lowering of the blood sugars and liver damage[6]. Others have reported its cause to be the inhibition of enzymic activities and disturbances in carbohydrate metabolism[14]. On the basis of the present study it is difficult to suggest the exact mode of protective action of Liv-52 against beryllium toxicity as it requires many physiological and biochemical investigations, but it can be safely said that Liv-52 certainly provides a protective shield against beryllium toxicity as it is known for correcting liver dysfunction[9, 10]. Investigations are in progress to elucidate the exact protective mechanism of Liv-52 in beryllium exposed rats in terms of its physiological and enzymological concurrences.

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ANNOUNCEMENTS

DIRECTORY OF FORTHCOMING CONFERENCES/SYMPOSIA, MEETINGS/WORKSHOPS ON SCIENCE AND TECHNOLOGY IN INDIA

(No. 13, July 1986 edition)

This publication is compiled by Shri S. K. Taneja, Senior Documentation Officer, Information and Documentation Division of the Department of Science and Technology, Ministry of Science and Technology, New Delhi.

The current number of the Directory—No. 13, July 1986 contains a list of 283 conferences/symposia/workshops/training courses/meetings to be organised in India from July, 1986 to 1990. While for most of the items, the dates/durations have been given, for a few items the exact dates are not furnished. The Directory lists all the events in chronological order. Each entry gives title, date, venue and address of the contact point/sponsoring body. The indices by subject and/or keyword as well as by location have been appended at the end of the publication to facilitate users for locating the desired entry.

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US FELLOWSHIP

Dr Jagannada Rau, Professor and Head of the Department of Chemical Engineering, Siddaganga Institute of Technology, Tumkur, has been selected for a ten month research on high density cultivation of micro organism in bio-reaction at the University of Missouri, Columbia, under the Indo US fellowship.