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BENEFICIAL EFFECTS OF ASPIRIN IN CYANATE-INDUCED HYPERCALCEMIA AND HYPERPHOSPHATEMIA IN RAT EYE LENS

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CYANATE reacts with lens protein and induces conformational changes¹. Bendazac was found to decrease binding of cyanate to lens proteins and prevent cyanate-induced elevation of phase separation temperature in incubated rat lens². Exposure to cyanate has been considered as an important risk factor in cataract formation in India³ and England⁴.

Investigations were carried out on the effect of cyanate and aspirin on the metabolism of calcium and phosphate in lens and serum of rat. These studies are of significance as both calcium and phosphate play key roles in a wide spectrum of biological processes including the formation of cataract.

Male albino rats were divided into two groups. Twenty-four rats of group I (control) were intraperitoneally injected with 0.1 ml Ringer's buffer solution, pH 8.2. Rats of group II (48) were injected with 0.1 ml cyanate (5 mg) dissolved in Ringer's buffer, pH 8.2. Twenty-four rats of group II were orally given 0.2 ml aspirin (9 mg in 60% alcohol) per day. All animals were sacrificed after 30 days and calcium (Ca^{2+}) and phosphate (HPO_4^{2-}) levels in blood and lens were determined by atomic absorption and spectrophotometric⁵ methods respectively.

Table 1 shows that the blood urea level increased

Table 1 Effects of cyanate and aspirin on blood pH, and urea, reduced glutathione (GSH) and ascorbic acid levels in blood and eye lens of rat

	Blood		Lens	
	pH	Urea (mg/100 mg)	GSH ($\mu\text{g/g}$)	Ascorbic acid ($\mu\text{g}/100\text{ mg wet wt}$)
Control (n=12)	7.4 \pm 0.1	9.24 \pm 1.32	1.40 \pm 0.11	4.24 \pm 0.24
Cyanate-treated (12)	7.1 \pm 0.1	14.01 \pm 1.42	1.06 \pm 0.10	2.65 \pm 0.19
Cyanate-treated, fed aspirin (12)	7.3 \pm 0.1	10.6 \pm 1.18	1.28 \pm 0.12	3.62 \pm 0.25

by about 52% in rats injected with cyanate. Feeding aspirin to cyanate-treated rats inhibited the increase in blood urea. The increased urea level in the cyanate-treated rats resulted in decrease of pH from 7.4 to 7.1. Reduced glutathione (GSH) and ascorbic acid levels in lens also decreased. Aspirin inhibited the decrease. The levels of calcium and phosphate in plasma increased by 45 and 10.6% respectively (table 2). Interestingly, the increase in plasma resulted in an increase in calcium and phosphate levels in lens by 53 and 33% respectively. The results also show that aspirin feeding produced significant inhibition of increase in calcium and phosphate levels, with complete inhibition in the case of lens.

These studies show that cyanate induces uraemia and acidosis in blood, which are considered to be amongst the relevant factors involved in the processes leading towards development of diarrhoeal cataract⁶. The significant decrease in lens GSH and ascorbic acid is in agreement with earlier findings that their concentration decreased in almost all experimental cataracts and in human senile cataracts⁷. The cyanate-induced hypercalcemia and hyperphosphatemia in the lens also confirm results reported earlier⁸. The presence of aspirin possibly minimizes the charges on proteins and protein-water interaction, and thus prevents changes in the lens. The potential effect of aspirin on the lens depends on its concentration after systemic administration.

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Table 2 Effects of cyanate and aspirin on levels of calcium and phosphate in plasma and lens of rat

	Plasma		Lens	
	Calcium (mg/100 ml)	Phosphate (mg/100 ml)	Calcium	Phosphate
Control (n=12)	10.27 ± 0.55	6.55 ± 0.31	0.60 ± 0.08	4.24 ± 0.21
Cyanate-treated (11)	14.95 ± 0.85	7.25 ± 0.29	0.92 ± 0.10	5.65 ± 0.24
Cyanate treated, fed aspirin (11)	8.01 ± 0.63	6.56 ± 0.71	0.66 ± 0.07	4.35 ± 0.20

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PRECIPITATION REACTIONS OF LECTINS WITH SERUM SAMPLES OF PATIENTS WITH VARIOUS MALIGNANT DISORDERS

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LECTINS are soluble proteins that can bind non-covalently to specific carbohydrate groups without modifying them chemically. By virtue of this property, lectins are useful in topographical studies of a wide variety of biological cell membranes. Their application to the study of tumour cells is a rapidly developing facet of cancer research¹⁻⁴; they not only agglutinate but also transform cells. Lectins also precipitate certain proteins. In the present study

an attempt has been made to distinguish between normal serum and serum of patients suffering from various malignant disorders by using different seed extracts. The seeds of many plants are known to contain lectins.

Extracts of 207 different seeds of plants belonging to 53 families were tested against serum samples of patients with history of various carcinomas or lymphoproliferative/haematologic disorders. Serum samples from normal healthy volunteer blood donors were used as controls. Seed extracts were prepared by a standard technique⁵. Each batch of lectin was standardized for protein concentration. Precipitation reactions were carried out by the Ouchterlony method⁶. The diffusion was carried out overnight at room temperature in a wet chamber.

Table 1 shows specific and non-specific precipitation activities in 26 seed extracts with serum samples of normal individuals and patients suffering from various carcinomas. It is interesting that normal serum samples vary from serum samples derived from various carcinoma patients. Seed extracts 1-4 gave non-specific precipitin bands; extracts 5 and 6 differentiated serum of patients with carcinoma of rectum from serum of normal individuals and patients with other malignant disorders; extracts 7-16 gave specific precipitation bands with serum from patients with carcinoma of gall bladder; 17 and 18 gave precipitin bands with serum of patients with carcinoma of stomach; 19 gave positive reaction with serum from patients suffering from malignancies of the ovary; 20 and 21 gave precipitation reaction with the serum of breast carcinoma patients; extracts 22-26 gave precipitin bands with serum from patients with carcinoma of scalp. No precipitation reaction was observed with serum from patients with carcinoma of larynx or broncheogenic carcinoma.

From the above results it is clear that serum of normal individuals can be differentiated from that of patients with various malignant disorders on the