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# INFLUENCE OF ASCORBIC ACID ON ACID AND ALKALINE PHOSPHATASE ACTIVITIES IN SOME METABOLICALLY ACTIVE TISSUES OF ASPIRIN TREATED RATS

KUSAL K. DAS* AND SHAKUNTALA DASGUPTA**

*Department of Physiology,*
*Al-Ameen Medical College,*
*Bijapur - 586 108*

and

***Department of Physiology,*
*University of Calcutta,*
*92, APC Road,*
*Calcutta - 700 009*

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**Abstract :** ACP and ALP activities in plasma were increased in aspirin treated groups for a period of seven days. Ascorbic acid supplemented groups showed no significant change in plasma ACP activity, but a significant change in ALP activity was found. ACP and ALP activities in liver and kidney were decreased significantly in aspirin treated animals. ACP activities in liver and kidney in ascorbic ackd supplemented groups showed no significant changes. No significant alteration of ALP activity in liver was found in ascorbic acid supplemented group but a significant changes was observed in kidney. Supplementation of ascorbic acid in high doses to rats fed aspirin can restore enzyme activities almost to the normal level.

**Key words :** acid and alkaline phosphatase, liver and kidney, aspirin, ascorbic acid

## INTRODUCTION

Aspirin (acetylsalicylic acid) is widely used as an analgesic, antipyretic and anti-inflammatory drug. Aspirin inhibits the cyclooxygenase activities and suppresses the production of prostaglandins in all cells (1). As aspirin has an antithrombotic efficacy, it is being actively explored for the prophylaxis of coronary and cerebral arterial thrombosis (2, 3). Aspirin is still the choice of drug for the treatment of rheumatoid arthritis, osteoarthritis and ankylosing spondilities.

Aspirin causes several unwanted effects: gastric or intestinal ulceration leading to severe bleeding with fatal end, CNS disturbances, acid-base and electrolyte imbalance of the body (1). Hepatotoxicity of aspirin has been reported and in some cases even renal toxicity has also been found (4). The administration of ascorbic acid in high doses to rats fed toxic metal in toxic doses can restore not only the growth rate but also restore the activities of alkaline phosphatase and succinic dehydrogenase.

The present study was designed to assess the effect of supplementation of ascorbic acid on acid and alkaline phosphatase activities in the plasma, liver and kidney of aspirin treated rats.

## METHODS

Normal adult male Wistar rats of 160 ± 5 g.b.wt. were used in the present study. The rats were divided into three groups of 10 animals in each. Group I served as

*Corresponding Author

control, the Group II received daily 36 mg/ 100 g.b.wt., of aspirin in a single dose orally for 7 days (5). The Group III received aspirin (36 mg/100 g.b.wt. orally) with ascorbic acid at a dose of 500 mg/d orally (1) also for 7 days. All the animals were fed with standard laboratory stock diet and water *ad libitum*. After completion of treatment, all the groups of animals were fasted overnight and killed by decapitation between 09.00 and 11.00 hr to avoid any possible diurnal variation. Blood was collected in heparinized tubes, plasma separated by centrifugation immediately. Liver and kidney were dissected out and adhering blood and tissue fluid were removed by blotting. Plasma and tissues were frozen at –20°C prior to enzyme assay. Each tissue was weighed and homogenized in a glass homogenizer, maintained at 0–4°C. Activities of ACP and ALP were estimated according to the standard method using P-nitrophenyl phosphate as the substrate (6). Data were statistically analysed by one way analysis of variance and Duncan's multiple range test.

## RESULTS

Table I shows that a significant increase in ACP and ALP activities occured in plasma of aspirin treated group (Group II) as compared with the control (Group I). The ACP activity in plasma of Group III (aspirin + ascorbic acid) shows no significant changes as compared with the control. Plasma alkaline phosphatase activity in Group II and Group III rats show a significant ($P < 0.05$) increase, but the change is less in Group III than the Group II when compared with the control.

It is evident from the results of Table I that ACP and ALP activities in liver and kidney have been decreased significantly in aspirin treated group as compared with the control. ACP activities in liver and kidney of Group III rats show no significant alteration when compared with the control. In Group III, liver ALP activity does not show any significant change in comparison with the control while kidney ALP activity decreases significantly both in Group II and Group III but the decrement is less in Group III (Table I).

## DISCUSSION

The present study showed increase ACP activity in the plasma with a concommitant significant decrease in liver and kidney of aspirin treated rats. Aspirin induced fall of ACP level in liver associated with rise in plasma suggest some alterations of lysosomal enzyme activities in hepatic tissues. The observation of a marked decrease of ACP in the kidney after aspirin treatment also suggests possible damage to the lysosomes of the renal tubules, causing a release of the enzyme from the tissue into the plasma (7). In Group III (Aspirin + Ascorbic acid) insiginificant alteration of ACP activities in plasma, liver and kidney may possibly reflect a protective effect of ascorbic acid on the liver and kidney cells against aspirin toxicity.

The present study also showed the significant increase of ALP activity in plasma but significant decrease in liver and kidney of aspirin treated rats. Increase plasma ALP activity may be the reflection of change in lysosomal enzyme activity in hepatic and renal tissues (7).

In Aspirin and Ascorbic acid exposed group, the noticeable improvement of ALP activities in liver and kidney also suggest that the ascorbic acid might have a protective action against the effect of aspirin on liver and kidney cells.

In clinical practice patients treated with aspirin, if supplemented with high doses of

TABLE I : Alteration in acid and alkaline phosphatase activities following the treatment with aspirin alone and in combination with ascorbic acid (means ± SEM, n=10).

| | *Groups of animal* | | |
|---|---|---|---|
| | I | II | III |
| **A. Acid phosphatase** | | | |
| Plasma (mmol/h/100 ml) | 0.66±0.04[a] | 0.83±0.03[b] | 0.70±0.03[a] |
| Liver (mmol/h/g of wet tissue) | 4.84±0.02[a] | 3.46±0.06[b] | 4.61±0.09[a] |
| Kidney (mmol/h/g of wet tissue) | 5.43±0.11[a] | 4.82±0.08[b] | 5.40±0.04[a] |
| **B. Alkaline phosphatase** | | | |
| Plasma (mmol/h/100 ml) | 12.42±0.68[a] | 19.24±0.32[b] | 17.34±0.24[b] |
| Liver (mmol/h/g of wet tissue) | 6.86±0.24[a] | 5.82±0.32[b] | 6.23±0.40[a] |
| Kidney (mmol/h/g of wet tissue) | 162.82±9.43[a] | 131.20±3.40[b] | 140.24±7.62[c] |

Group I = Control; Group II = Aspirin; Group III = Aspirin + Ascorbic acid
In each horizontal row values with different superscripts were significantly different from each other ($P < 0.05$).

ascorbic acid might be beneficial in preventing some of the deleterious effect of aspirin. Our experimental results on rats warrant further evaluation in protective action of ascorbic acid in patients treated with aspirin.

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