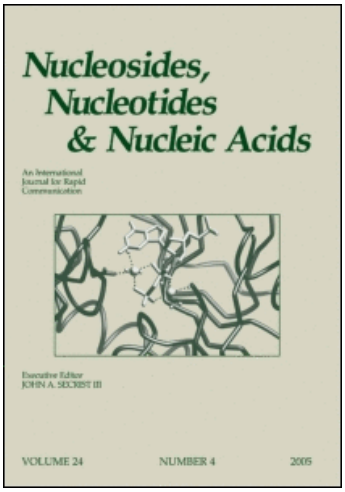

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EFFECTS OF ALLOPURINOL ON BEER-INDUCED INCREASES IN PLASMA CONCENTRATIONS OF PURINE BASES AND URIDINE

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□ *We investigated the effects of allopurinol on beer-induced changes in the plasma concentration and urinary excretion of purine bases. Five healthy subjects underwent three studies: ingestion of beer after taking 300 mg allopurinol (combination study); ingestion of beer alone; ingestion of allopurinol alone. Increased plasma concentrations and urinary excretion of hypoxanthine were greater in the combination study than the beer alone study. However, increases in total plasma purine base concentrations were greater in the beer alone study, even though increases in plasma uridine concentrations did not differ. Beer-induced increases in plasma concentrations of purine bases appear partially offset by increased urinary excretion of hypoxanthine after allopurinol, which also controls increases in plasma uric acid levels caused by alcoholic beverage ingestion.*

Keywords Beer; allopurinol; hypoxanthine; uric acid; uridine

INTRODUCTION

It is well known that ethanol metabolism enhances ATP consumption and adenine nucleotide degradation, which produces hypoxanthine, xanthine, and uric acid, leading to increases in their concentrations in human plasma.[1–4] However, the effects of anti-hyperuricemic agents on the ethanol-induced increases in plasma concentration and urinary excretion of purine bases, especially oxypurines, have not been examined in detail. We investigated the effects of allopurinol on beer-induced changes in the plasma concentration and urinary excretion of purine bases.

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MATERIALS AND METHODS

Five healthy subjects were studied in three separate experiments. In the first experiment (combination study), the subjects ingested beer (10 ml/kg body weight) 13 hours after taking allopurinol (300 mg). In the second experiment (beer alone study), the same subjects ingested beer alone, while in the third experiment (allopurinol alone study), they took allopurinol alone. There was a two-week interval between each study.

RESULTS

Plasma Concentration of Purine Bases and Uridine

Beer ingestion increased plasma concentrations of hypoxanthine, xanthine, and uric acid in the beer alone study. In the combination study, beer did not cause an increase in plasma uric acid concentration, though it increased the concentrations of hypoxanthine and xanthine. The increase in plasma hypoxanthine concentration in the combination study was greater than that in the beer ingestion study. In addition, the increase in plasma xanthine concentration in the combination study was greater than that in the beer ingestion study. In the allopurinol alone study, the plasma concentrations of purine bases were not changed. The combined increases in plasma hypoxanthine, xanthine, and uric acid concentrations at the same time points were greater in the beer alone study than in the combination studies. Beer ingestion also increased the plasma uridine concentration in the beer alone and combination studies. These values at the same time points were not different between the beer alone and combination studies.

Urinary Excretion of Purine Bases

The urinary excretion of uric acid did not change under any of the conditions that were examined, while hypoxanthine and xanthine excretion was increased by beer ingestion in both the combination and beer alone studies. However, the increase in urinary hypoxanthine excretion of due to beer ingestion was significantly greater after pretreatment with allopurinol than without pretreatment.

Plasma Concentration of Ethanol and Oxypurinol

Plasma ethanol concentrations were not different at the same time points between the combination and beer ingestion studies. Plasma oxypurinol concentrations did not change throughout the time periods in the combination study or in the allopurinol alone study.

DISCUSSION

In the present study, the beer-induced increase in plasma uridine level, which largely reflects adenine nucleotide degradation was not significantly different between the combination and beer alone studies. However, plasma hypoxanthine was markedly increased in the combination study, as compared with that in the beer alone study. These results suggest that beer enhances purine degradation and allopurinol inhibits xanthine dehydrogenase activity, together leading to the marked increase in plasma concentration and urinary excretion of hypoxanthine seen in the combination study.

In addition, the combined increase in plasma hypoxanthine, xanthine, and uric acid concentrations was greater in the beer alone study than in the combination study. This may be due to the greater increase in urinary excretion of hypoxanthine caused by the marked increase in plasma hypoxanthine concentration in the combination study. Conversely, the urinary excretion of uric acid was not changed at any time during the combination and beer alone studies, and increases in urinary excretion of xanthine and uric acid were not significantly different between those studies.

Finally, allopurinol administration inhibited the beer-induced increase in plasma concentration of uric acid without significant effects on the plasma concentration of oxypurinol. These findings suggest that allopurinol intake may be effective in controlling the rapid increase in plasma uric acid caused by the ingestion of a moderate quantity of alcoholic beverages. Although these findings are clinically important, it remains to be determined if 300 mg of allopurinol can inhibit the increase in plasma uric acid concentration caused by ingestion of a large quantity of beer; thus, additional experiments are needed.

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