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Short Communication

Urinary Excretion of Salicyluric Acid in Female Volunteers During Summer

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ABSTRACT

Urinary excretion of salicyluric acid was studied in twelve healthy female volunteers after oral dose of 600 mg soluble aspirin. Urine samples collected at predetermined time intervals and the concentration of salicyluric acid was determined calorimetrically. Mean ± SE value for pH of urine in this study was 6.04±0.14, diuresis was 0.029±0.005 mL min^{-1} kg^{-1}, concentration of salicyluric acid was 139.49±27.40 μg mL^{-1}. Mean ± SE value for rate of excretion of salicyluric acid was 2.79±0.54 μg $min^{-1}kg^{-1}$, percent dose excreted was 3.15±0.56% and percent cumulative amount excreted was 18.97±3.32%. It was found that percent cumulative excretion rate of salicyluric acid was low under indigenous conditions.

Key Words: Aspirin; Salicyluric acid; Urinary excretion

INTRODUCTION

Aspirin/acetylsalicylic acid is the most commonly used therapeutic agent for the treatment of different diseases as post operative pain, dental surgery, headache, acute and chronic musculoskeletal pain (Walker, 1995). It also prevents the aggregation of platelets (Henackens *et al*., 1989). Which is increasingly used in the prophylaxis of ischemic heart diseases and strokes (Babu & Salvi, 2000). Aspirin is used as antibiotic primer, antihistaminic, decongestant, cold remedy and in minor injuries. It is also helpful in dismenorrhoea, arthralgia, myalgia and fever. Aspirin if tolerated, is preferred drug for the treatment of osteoarthritis and rheumatoid arthritis (Anonymous, 1970).

The effectiveness of aspirin is largely due to its capacity to inhibit prostaglandin biosynthesis. It is due to irreversible blocking cycloxygenase enzyme which catalyses the conversion of arachidonic acid to endoperoxide compounds (Stoker, 2001). Aspirin, it hydrolyzes in stomach and blood to salicylic acid and acetic acid. The biological half life is therefore 20-25 minutes (Done, 1960). Approximately 80% of small doses of salicylic acid is metabolized in the liver. Conjugation with glycine forms salicyluric acid and with glucouronic acid forms salicyl, acyl phenolic glucuronides (Levy & Tsuchiya, 1972). The major route of elimination of salicylate is via salicyluric acid that is 75% (Levy, 1965). Many factors such as age, specie, seasons, sex variation and enzyme inhibition affect the metabolism of drug (Low, 1998). Genetic and environmental factors contribute a major role in inter and intra-individual variability in metabolism of drug. A series of indigenous studies in human beings and animals have clearly indicated that the metabolism and urinary excretion of investigated drugs were different under indigenous conditions when compared with values given in literature (Kouser, 2002).

Thus, keeping in view, the indigenous conditions of Pakistan, the present project was designed to study the urinary excretion of salicyluric acid in healthy female volunteers during summer after oral administration of aspirin.

MATERIALS AND METHODS

The experiment was conducted in laboratory of Chemistry Department on 12 healthy female volunteers. They were having age between 20-23 years, body weight 59-72 kg and height 170.18-182.88 cm. Each volunteer was informed with aims and course of study and a written consent was obtained from each one. The sampling was done in the May, 2003. Volunteers did not receive any medication one week prior to and during the course of study. After overnight fastening, control urine sample was collected from each volunteer before the administration of 2x300 mg Disprin (soluble aspirin). Urine samples were collected at 30, 60, 120, 180, 240 and 600 minutes after oral administration of drug. The total volume of urine voided at particular time was noted. The pH of all urine samples was recorded by pH meter and kept in freezer at -20°C till analysis. Quantitative determination of salicyluric acid was carried out by a validated colorimetric method of Levy and Procknal as modified by Farid *et al*. (1975).

Urinary excretion. Urinary excretion of drug was studied by calculating the following formulae:

Concentration of drug (μg mL^{-1}) = Standard factor x absorbance

$$Diuresis\,(mL\text{min-1kg-1}) = \frac{Volume\ of\ urine\ in\ collection\ period}{Time\,(\text{min}) \times body\ weight\,(kg)}$$

Amount of drug excreted = Uc x Uv

Where, Uc = concentration of drug in urine (mg)

Uv = total volume of urine voided.

$$\%age\ of\ dose\ excreted = \frac{amount\ of\ drug\ excreted\,(mg)}{total\ dose\,(mg)\ given} \times 100$$

$$\%age\ cumulative\ dose\ excreted = \frac{cumulative\ amount\ excreted\,(mg)}{total\ dose\ of\ drug\ given} \times 100$$

Statistical analysis. Results were subjected to statistical analysis according to mean ± SE values (Steel *et al*., 1997).

RESULTS AND DISCUSSION

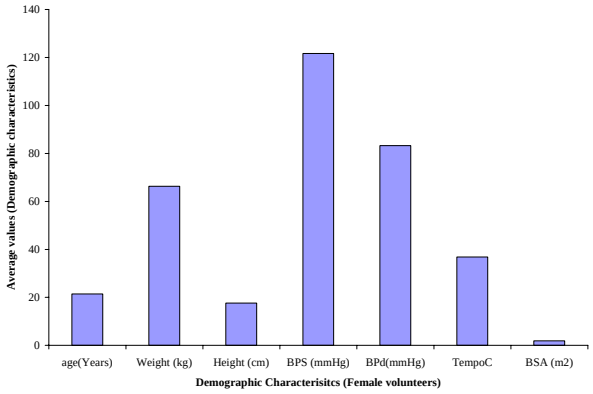
Excretion is a process by which drug or its metabolites are eliminated from the body without chemical change (Mary *et al*., 2000). Urinary excretion of drug depends upon pH of urine, dose of drug given and diuresis i.e. rate of urine flow.

The demographic representation of 12 healthy female volunteers is shown in Fig. 1. Mean ± SE value for pH was 6.04±0.14 and is comparable to mean value 6.17±0.18 for male volunteers (Sumaira, 2003). Mean ± SE value for diuresis was 0.029±0.005 mL min^{-1} kg^{-1}. The value is less than earlier reported value 0.037±0.17 mL min^{-1} kg^{-1} (Fozia, 1998). The difference is due to environmental differences because in hot climate the evaporation reduces the urine flow during summer while environmental temperature increases the rate of urine during winter (Nawaz & Shah, 1984). Mean ± SE value for concentration of salicyluric acid in female volunteers was 139.49±27.40 μg mL^{-1}, while after 10 h the value was 237.62±49.92 as shown in Table I. Concentration of the drug depends upon the pH of fluid and pKa value of drug. Mean ± SE value for rate of excretion in this study was 2.79±0.54 μg min^{-1} kg^{-1} which is comparable to the value 3.83±0.85 μg min^{-1} kg^{-1} (Sumaira, 2003). The difference is due to different pH. Mean ±SE value for amount excreted as salicyluric acid was 18.97±3.32 mg. While mean ± SE value for percent amount or dose excreted as salicyluric acid was 3.15±0.56% which is less than the value (9.85±2.48) reported in female volunteers in winter (Asif, 2003). The difference may be due to environmental conditions such as temperature. Mean ± SE value of cumulative amount (mg) excreted as salicyluric acid in female volunteers was 57.39±.31 mg, while percentage cumulative amount excreted was 18.97±9.57% which is less than the value present after 10 h of oral drug administration.

Table I. Concentration (μg/mL)) of acetylsalicylic (aspirin) excreted as salicyluric acid in the urine of human female volunteers following oral dose of 600 mg

Time (min)	Mean (n=12)	SE
30	86.05	12.55
60	202.62	59.29
120	123.23	17.14
180	94.43	11.84
240	93.00	13.63
600	237.62	49.92

Fig. 1. Average values for the demographic characteristics of twelve female volunteers



It was concluded that the urinary excretion of salicylceric acid during summer in female volunteers was different.

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