Asian Journal of Chemistry Vol. 20, No. 2 (2008), 853-856

Reactions of Renal Calculi with Some Natural Products Rich in Polyphosphates and Hydroxy Acids

ANJUM FATMA†, BASABI MAHAPATRA (CHOUDHURY)* and NAGMA SIDDIQUI†
Department of Chemistry, Patna Women's College, Bailey Road, Patna-800 001, India

Renal calculi are, in general hard to break, the hardness varies from stone to stone depending on their constituents and size. We have endeavoured to solubilize the insoluble irgradients of renal ccalculi (whole and powdered) with extracts of some natural products by carrying out reactions at room temperature *in vitro*.

Key Words: Renal calculi, Polyphosphate, Hydroxy acids.

INTRODUCTION

Renal calculi are hard enough to be broken, particularly when they are big in size, even with extracorporeal shock wave lithotripsy[1,2]. The process always carries a high risk of leaving fragment behind that eventually will obstruct the ureter and necessiate further endomological procedures.

An attempt was made to break the hard crust of a renal calculus by dissolving part of it once a portion of the hard crust is gone, the calculus becomes susceptible to attack. The reagents (that is natural product extracts rich in inorganic and organic phosphates and/or hydroxy acids) then further dissolve the calculus and the calculus crumbles. Once a renal calculus is broken into small pieces, it can be easily flushed out of the system.

EXPERIMENTAL

All the renal stones *viz.*, sample nos. 1, 2, 3, 4 were properly washed with distilled water and then each stone was suspended separately in 20 mL of 0.1 N NaCl solution for 24 h. The samples were filtered washed with distilled water, dried in air oven at 80 ºC, cooled and weighed.

Weighed amount of renal stones were suspended separately in 20 mL extracts of radish leaves (fresh) and stirred slowly and constantly on a magnetic stirrer for 5 h and then kept overnight. The next day, the solutions were again stirred for another 5 h and then filtered. The undissolved stones were taken out, washed with distilled water, dried in an air oven at 80 ºC,

†Department of Chemistry, Patna University, Patna-800 005, India.

cooled and then weighed out. The experiments were repeated 5 times with every stone. Experiments were continued exactly in the same manner with extracts of aniseed. The same procdure was repeated with powdered renal stones (Tables 1-4).

TABLE-1
SOLUBILITY OF WHOLE RENAL STONES IN RADISH LEAVES EXTRACT

Natural product	Fresh/ hydrolyzed	Sample no.	Wt. of whole renal stone (mg)	Wt. remained after extract treatment (mg)	Difference (solubility in mg/100 mL)	Solubility (%) mg/100 mL of extract
Radish leaves	Fresh	1	146.0	98.0	48.0	32.88
Radish leaves	Fresh	2	104.0	99.0	05.0	04.81
Radish leaves	Fresh	3	52.0	22.5	29.5	56.73
Radish leaves	Fresh	4	585.8	475.3	110.5	18.86
Radish leaves	Hydrolyzed	1	105.0	43.0	62.0	59.05
Radish leaves	Hydrolyzed	2	99.0	91.5	7.5	7.58
Radish leaves	Hydrolyzed	3	44.5	9.1	35.4	79.55
Radish leaves	Hydrolyzed	4	475	330.0	145.0	30.52
Radish leaves	SHP	3	35.0	11.8	23.2	66.29
Radish leaves	SHP	4	41.4	30.3	11.1	26.81

SHP = Sodium hexameta phosphate

TABLE-2
SOLUBILITY OF WHOLE RENAL STONES IN ANISEED EXTRACT

Natural product	Fresh/ hydrolyzed	Sample no.	Wt. of whole renal stone (mg)	Wt. remained after extract treatment (mg)	Difference (solubility in mg/100 mL)	Solubility (%) mg/100 mL of extract
Aniseed	Fresh	1	41	34	7	17.07
Aniseed	Fresh	2	38	23	15	39.47
Aniseed	Fresh	3	74.3	59.8	14.5	19.52
Aniseed	Fresh	4	32.3	24.2	8.1	25.08
Aniseed	Hydrolyzed	1	47.6	36.2	11.4	23.95
Aniseed	Hydrolyzed	2	51.3	26.6	24.7	48.15
Aniseed	Hydrolyzed	3	52.6	34.7	17.9	34.03
Aniseed	Hydrolyzed	4	38.8	25.5	13.3	34.28

TABLE-3
SOLUBILITY OF POWDERED RENAL STONES IN RADISH LEAVES

Natural product	Fresh/ hydrolyzed	Sample no.	Wt. of whole renal stone (mg)	Wt. remained after extract treatment (mg)	Difference (solubility in mg/100 mL)	Solubility (%) mg/100 mL of extract
Radish leaves	Fresh	2	100	47.0	53.0	53.00
Radish leaves	Fresh	3	50	34.0	16.0	32.00
Radish leaves	Fresh	4	50	10.2	39.8	79.60
Radish leaves	Fresh	2	100	38.0	62.0	62.00
Radish leaves	Hydrolyzed	3	50	29.0	21.0	42.00
Radish leaves	Hydrolyzed	4	50	2.7	47.3	94.60
Radish leaves	SHP	3	30	0.0	30.0	100.00
Radish leaves	Decahydrate	4	30	4.3	25.7	85.67

SHP = Sodium hexameta phosphate

TABLE-4
SOLUBILITY OF POWDERED RENAL STONES IN ANISEED EXTRACTS

Natural product	Fresh/ hydrolyzed	Sample no.	Wt. of whole renal stone (mg)	Wt. remained after extract treatment (mg)	Difference (solubility in mg/100 mL)	Solubility (%) mg/100 mL of extract
Aniseed	Fresh	1	30	17.0	13.0	43.33
Aniseed	Fresh	2	30	7.0	23.0	76.67
Aniseed	Fresh	3	50	31.7	18.3	36.60
Aniseed	Fresh	4	40	25.7	14.3	35.75
Aniseed	Hydrolyzed	1	30	11.0	19.0	63.33
Aniseed	Hydrolyzed	2	30	0.0	30.0	100.00
Aniseed	Hydrolyzed	3	50	24.4	25.6	51.20
Aniseed	Hydrolyzed	4	40	17.5	22.5	56.25

The whole/powdered calculi were treated with fresh extracts of different natural products *viz.*, radish leaves and aniseed extracts followed by treatment with hydrolyzate extracts of the same natural products and the differences in weight of whole calculi, before and after treatment with extracts gave a clear indication of dissolution of some ingradient of the calculi, which remained in the solution.

RESULTS AND DISCUSSION

The results of the experiements shows that, the percentage solubility of the whole renal calculi in the hydrolyzate extracts are more than in their corresponding fresh extracts.

When powdered renal calculi were treated with fresh any hydrolyzate extract of the different natural products and the weight differences calculated before and after the treatments, it was found that the percentage solubility of the powdered renal calculi are more in hydrolyzate extracts than in their corresponding fresh extracts. Further it was found that the dissolution of stone ingradient in powdered renal calculi was more than the whole renal calculi.

The present experimental studies have indicated that by increasing the surface area of a calculi available for dissolution of natural products, the percentage solubility increased markedly. Further, it can be inferred that, the outer surface of the calculi is much stubborn and the extracts are not able to react so easily, to make soluble the ingradients of the calculi nevertheless, the dissolution of a part of the ingradient of the whole renal calculi, definitely loosen the hardness of the calculi.

This calculi then become very much succeptible to attacks and the extracts then further disolve the calculi and the calculi crumble.

REFERENCES

1. F. Hinman Jr., *J. Urol.*, **121**, 700 (1979).
2. B. Ettinger, *Am. J. Med.*, **61**, 200 (1976).

(*Received*: 25 September 2006; *Accepted*: 26 September 2007) AJC-5907