

### 3. Title: Study of Organic Matrix of Stone.

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#### Objectives

To study the organic matrices of stones from patients in various parts of Thailand.

#### Description

Thus far, 21 bladder stones obtained from patients, aged 1 to 5 years, have been studied.

Isolation of the matrix components, demineralization and fractionation were accomplished by the method described by Keutel<sup>(1)</sup>. The stones were powdered and demineralized with 5% EDTA solution for 3 days, then with 0.1 M Veronal (pH 8.6) for 24 hours and with weak basic solution (pH 11.4) for 2 hours under continuous stirring. After demineralization, they were dialyzed against alkaline solutions and demineralized water. Ten percent of the solutions was lyophilized and determined for the total organic matrix. The rest was analyzed for the subfractions of the matrix, using the method described by Keutel.

Identification of the Amino Acids and Carbohydrate Component was also performed by chromatographic technic as described by King and Boyce<sup>(2)</sup>.

#### Progress

Table I shows that organic matrix comprised from 1.7 to 3.3 percents of the total weight of stones. Ammonium urate and calcium oxalate were the main chemical compositions of stones. The organic matrix contents did not seem to correlate with either the age of patients or the mineral compositions. None of our stones was free from the organic matrix.

The percentage of matrix by weight was reported by Gasser et al<sup>(3)</sup> as 3 to 5%, by Philipsborn<sup>(4)</sup> as 2 to 3.5%, by Boyce and Garvey<sup>(5)</sup> as averaging 2.87%, and by Keutel<sup>(1)</sup> as averaging 2.75% for the inorganic-crystalline stones and 1.06% for the organic-crystalline stones. The present results are comparable to those of renal stone reported previously.

The preliminary results of Amino Acids detectable by chromatography in one stone, obtained from a male patient aged 5 years, are presented in Table II. Chromatographically, 5 carbohydrates were also identified. These included galactose, glucose, mannose, rhamnose and one unidentified spot. These results are similar to the composition of calculi reported by King and Boyce<sup>(2)</sup>. Further study is required before any conclusion can be drawn.

## REFERENCES

1. Keutel, H.J.: Fractionation of Kidney Stone Matrix. *Urol. Int.* 19:233-243 (1965)
2. King, J.S.,- Boyce, W.H.: Amino acid and carbohydrate composition of the mucoprotein matrix in various calculi. *Prox. of the Society for Exp. Biol. and Med.* 95:183-187, 1957.
3. Gasser, G., Brauner, K., and Preisinger, A.: Das Harnstein problem I.Z. *Urol.* 49:148 (1956).
4. Philipsborn, V., H.: Zur Harnsteinbildung aus der Sicht des Mineralogen. *Urol. int.* 7:28 (1958).
5. Boyce, W.H. and Garvey, F.K.: The amount and nature of the organic matrix in urinary calculi: A review. *J. Urol.* 76:213 (1956).

Table I  
Isolation of Organic Matrix of Stones

No. of Subjects and Stones	Average age years	% matrix	Crystal Composition					
			Am. Urate	Ca Ox	CaPO <sub>4</sub>	MgNH <sub>4</sub> PO <sub>4</sub>	Ca Carb	Mg Carb
3	1 yr	3.31	4 <sup>+</sup>	1 <sup>+</sup>	1 <sup>+</sup>	1 <sup>+</sup>	trace	trace
5	1 <sup>+</sup> 1 -2	1.65	4 <sup>+</sup>	1 <sup>+</sup>	1 <sup>+</sup>	1 <sup>+</sup>	trace	1 <sup>+</sup>
5	2 <sup>+</sup> 2 -3	2.21	4 <sup>+</sup>	3 <sup>+</sup>	1 <sup>+</sup>	1 <sup>+</sup>	1 <sup>+</sup>	2 <sup>+</sup>
6	3 <sup>+</sup> 3 -5	2.93	4 <sup>+</sup>	3 <sup>+</sup>	2 <sup>+</sup>	2 <sup>+</sup>	1 <sup>+</sup>	1 <sup>+</sup>
2	unknown	2.15	4 <sup>+</sup>	3 <sup>+</sup>	—	—	—	—

Table II  
Amino Acids Identified Chromatographically

Alanine	Glycine
Glutamic acid	Threonine
Aspartic acid	Lysine
Serine	Proline
Leucine	Tryptophane
Isoleucine	Tyrosine
Valine	Methionine
Phenylalanine	Arginine