INSTRUMENTAL NEUTRON ACTIVATION ANALYSIS OF URINARY CALCULI


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Five kinds of urinary stones from 42 patients have been determined for a total of 19 elements by instrumental neutron activation analysis. Of these elements, Ca, Mg, Sr, Na, and Cl are found to be present in the core of all kinds of stones. The differences in elemental composition among the different kinds of stones as well as across the layers of stone are statistically evaluated.

INTRODUCTION

Calculi are deposited chemicals formed through several incompletely understood physico-chemical processes. The chemical constituents of most urinary calculi are oxalates, phosphates, urates, carbonates, cystines and xanthines. Calcium is a major cationic constituent
to the amount of 90% of all renal calculi\textsuperscript{1}. While the major constituents are well known, the trace element composition of the calculi is still rarely clarified.

Only a few papers dealt with multi-element determination in the urinary stones so far. Formitchev\textsuperscript{2} detected 18 elements in the stones by polarization analysis. He found that Ca, Mg, P, Na, and Sr are commonly present in the stones and pointed out that Al, Cu, Pb, Zn and Si have important role in the calculi formation. Jacimovic et al.\textsuperscript{3} determined Hg, Cr, La, Sc, Co, Fe, and Sb in the stones by INAA and found that Co, Fe, and Sb are the elements most frequently appeared in the stones. Donev et al.\textsuperscript{4} determined Fe, Zn, Cr, Cd, Co, Hg, Sr, Se, Cu, Br, Na, and K in the stones also by INAA and concluded that Na, Co, and Cr are present in all of the samples. A recent work demonstrated the applicability of ICP-AES as a useful method for the routine determination of Ca, Mg and P in human stones\textsuperscript{5}.

The present study is aimed at investigating the elemental composition, major and trace, in urinary calculi, and at evaluating their relative importance in the cause of stone formation based on the statistical analysis of the data obtained. Instrumental neutron activation analysis /INAA/ is used in this study because of its high sensitivity, multielement capability and non-destructive property.

EXPERIMENTAL

The sample stones from 42 patients were supplied by the Department of Urology of the Hospital of Kaohsiung Medical College. The crystalline types of calculi were analyzed by polarizing microscopy. As a result they