

Research on trace elements within urinary calculi from patients in southern China

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The identification of urinary calculi composition provides significant information about possible causes of stone formation, which is critically useful in therapy for stone. Previous studies on kidney stones have been limited by routine analysis method. In this study, LA-ICP-MS(Laser Ablation Induced Couple Plazma Mass Spectrometry) which is capable to detect the trace elements has been used to evaluate the composition of kidney stones.

A total of 30 samples of urinary calculi stones from patients who live in Guangdong province, southern China have been retrieved to carry out the study. These kidney stones were collected after open surgery and endoscopic procedures. Mineral structure of the stones were determined using X-ray Diffraction, trace element contents were obtained using Laser Ablation ICP-MS. The outcome were to compare with some overseas studies.

The evaluation study of urinary stones using X-ray Diffraction showed that the most common mineralogical forms are calcium oxalate monohydrate (COM, $\text{CaC}_2\text{O}_2 \cdot \text{H}_2\text{O}$) followed by calcium oxalate dihydrate (COD, $\text{CaC}_2\text{O}_2 \cdot 2\text{H}_2\text{O}$) and small proportion of magnesium ammonium phosphate,while COM were significantly higher in all of the selected stones. LA-ICPMS analysis results were as follow: zinc (Zn) content of 14.25-53.12ppm, copper (Cu) content of 2.26-13.67ppm, Manganese (Mn) of 1.032-4.852ppm, iron (Fe) of 274.98-357.90ppm; chrome (Cr) of 1.142-1.365ppm, nickel (Ni) of 0.957-3.357ppm, cobalt (Co) of 0.728-0.952ppm, and Strontium (Sr) of 109.92-275.21ppm range. The data with statistical significance of ($P<0.05$).

Abnormal content of trace elements were identified in urinary calculi from patients.The results showed that high concentrations of elements within the stones including Sr, Zn, Fe, Cr, Mn, Cu, Ni and Co. Some trace elements affect crystallization of urinary stones by influencing the external morphology of growing crystals and may affect the speed of their crystallization.