

Effects of millet on calcium oxalate crystal growth and dissolution

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The influence of millet on the crystallization and the dissolution of calcium oxalate crystals was investigated in detail under supersaturated and artificial urinary circumstances in order to understand the effect of millet on calcium oxalate kidney stones in humans. The supersaturated solutions were prepared by mixing aqueous solutions of CaCl_2 and $\text{Na}_2\text{C}_2\text{O}_4$. Typical standard reference artificial urine solutions were prepared to simulate the natural urine conditions for the experiments. To investigate the inhibition effect, different volumes of millet were separately added to the supersaturated solutions and artificial urinary solutions and crystal deposition process was monitored by UV-vis and conductivity measurements. The obtained crystals were characterized by FT-IR, SEM, TGA and redox titrations in order to determine the structure and the morphology of calcium oxalate crystals formed. Our findings indicate that the crystals obtained from inhibition and dissolution experiments are of thermodynamically more stable calcium oxalate monohydrate. Furthermore, the results show that the millet has a promising inhibition effect in the supersaturated solution and in artificial urinary circumstances showing 24% and 16% decrease in crystal deposition respectively with 50 mL of millet compared to control experiments. The dissolution effect of millet is far more superior to that of the inhibition effect. One gram of calcium oxalate monohydrate crystals fully dissolved in millet when the crystals were washed ten times with 300 mL millet solutions. Under the same conditions, the control experiment showed only 44% dissolution of calcium oxalate crystals.

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