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Effect of Lemon juice on crystallization and crystal growth inhibition and dissolution of struvite crystals – an in vitro study

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Objectives: Struvite stones are composed of magnesium ammonium phosphate ($MgNH_4PO_4.6H_2O$) and calcium carbonate (apatite).They are formed as a result of recurrent and chronic urinary tract infections mainly in female.Crystal growth in biogenic, natural and synthetic materials is generally regulated by macro and micromolecules.Struvite stones are composed of magnesium ammonium phosphate ($MgNH_4PO_4.6H_2O$) and calcium carbonate (apatite).They are formed as a result of recurrent and chronic urinary tract infections mainly in female.Crystal growth in biogenic, natural and synthetic materials is generally regulated by macro and micromolecules.

Methods: In this *in vitro* study the inhibitory effect of lemon juice in artificial urine was investigated against formation of struvite crystals. Struvite crystallization intensity was determined using single gel growth techniques. The crystals grown in presence of lemon juice and control were characterized by Attenuated Total Reflectance Fourier Transform Infrared Spectroscopy (ATR-FT-IR), X-ray powder Diffraction (XRD) and Field Emission Scanning Electron Microscope (FESEM). In addition, using an *in vitro* model, dissolution of struvite crystal in synthetic urine, was also evaluated.

Results: lemon juice showed less growth of struvite crystals in and dissolved rapidly with the increasing concentrations of lemon juice. As monitored by light microscopy, presence of lemon juice in the media slowed the crystal growth and the crystals assumed an octahedral crystal habit. ATR-FT-IR spectra of struvite crystals revealed the presence of characteristic functional groups. Powder XRD study also confirmed the structural similarity of the crystals grown *in vitro*. Crystals grown in the presence of lemon juice were pitted on their surface as shown by FESEM.

Conclusions: lemon juice can modulate the formation of struvite crystals and can hence be explored in to their potential application in the inhibition of struvite stone formation.

formation of struvite stone