ABSTRACT

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Urinary stone is defined as any object resulting from a liquid-solid phase transition in urine. The formation of crystalline particles in tubular fluid as well as in urine comprises two major physicochemical aspects, viz. thermodynamic and kinetic. Whewellite (CaC₂O₄⋅H₂O), brushite (CaHPO₄⋅2H₂O) and struvite (MgNH₄PO₄⋅6H₂O) are the most important constituents of urinary stone crystals.
The physical characteristics of the biological crystals as they develop in the human body and similar crystals grown in the laboratory in a homogeneous or heterogeneous environment of crystal growth are found to be very similar. So, it is possible to utilize the same physical principles in the study of biological crystals and those crystals that are grown in the laboratory.

A preliminary study made by us with urine samples showed that crystals are easily grown in urine samples obtained from sugar (diabetes) patients. As it is possible that the antidiabetic drugs consumed may promote the stone formation, a success in finding a possible way to prevent this crystal formation will be of immense help to the mankind. The present study is an attempt (more qualitative than quantitative) in this direction.

In order to understand the effect of some commonly consumed antidiabetic drugs, viz. glyciphage, daonil and semiglynase on the formation of whewellite, brushite and struvite crystals, we have grown these crystals without and with adding these drugs separately with four to five concentrations in each case. The crystals were grown in-vitro by the gel method and characterized by density and total product mass determinations, thermogravimetric analysis and X-ray diffraction, FT-IR spectral and hardness measurements.

By carefully observing the shape, size, transparency and approximate number of crystals obtained and also from the knowledge of their total product mass, conclusions were derived regarding the promotery / inhibitory effect of the drug incorporated.
Also, we have attempted to investigate the effect of juices of tomato, lime and cucumber (advised for the diabetic patients to take frequently) in balancing the unwanted effects caused by the antidiabetic drugs.

The results show that the drugs have, in general, promotery effects on the formation of all the three crystals (except semiglynase in the case of struvite). Attempt to balance this unwanted effect was successful with the juices of tomato, lime and cucumber.

A report of this research work is presented in detail in this thesis.