CHAPTER 5

SUMMARY AND SUGGESTIONS FOR FUTURE WORK

5.1 SUMMARY

Single crystals of cholesterol have been grown in the gel medium using solubility reduction technique. Gel was prepared by dissolving sodium meta silicate in double distilled water to the required density. The sodium meta silicate solution was titrated against glacial acetic acid to adjust the pH in the range from 4 to 6. The supernatent solution was prepared by dissolving cholesterol in various solvents namely acetone, ethanol, acetic acid and isopropanol. After the gelation, the supernatent solution was poured gently on the top of the gel. Since cholesterol is sparingly soluble in water, as it diffuses inside the gel medium, the solubility of the cholesterol in the solvent reduced and due to the supersaturation, single crystals were formed. It took approximately one to three days for the nucleation to be observed visually. The nucleation and the final size of the grown crystals depend on the pH of the medium, concentration of the supernatent solution and density of the gel solution. The morphologies (platy and needle) are independent of the pH, density of the gel and concentration of the supernatent solution. When cholesterol dissolved in acetone or isopropanol was used as the supernatent solution, a ring pattern of platy and needle crystals was observed initially. The needle crystals were slowly transformed into platy crystals in a period of two months due to Ostwald's ripening. The maximum size of the platy crystals for a growth period of three months varied from 0.1 * 0.2 mm to a maximum of 0.4 * 0.6 mm. Isopropanol was
used as the solvent to prepare supernatent solution to study the effect of medicinal plants on the growth of cholesterol.

The important medicinal plants which are used in sidha medicine and in folk medicine for the treatment of hypolipidaemia were used to study their effect on the crystallization of cholesterol.

The extracts of the plants Commiphora mukul, Acalifetus indica and Allium cepa reduced the size of the crystals from 10 to 200 times compared to control. The plants such as Allium sativum, Hibiscus rosa sinensis, Aegle marmeleos, Pterocarpus marsupium, Allium cepa, Solanum xanthocarpum, Ericostemma lyssopifolium, Alphinia officinarum, Trigonella foenum graecum, Phyllanthus niruri, Curcuma longo, Solanum trilobatum, Cynoden dactylon, Polygala javana and Musa paradisiaca reduced the number density from 2 to 9 times that of the control.

The morphology of the crystals was changed from platy to dendrites when extracts of the plants Polygala javana, Cynoden dactylon, Ericostemma lyssopifolium, Alphinia officinarum, Musa paradisiaca, Solanum trilobatum, Trigonella foenum graecum were added.

The morphology of the crystals was changed from platy to multiplet when the extracts of the plants of Solanum trilobatum, Alphinia officinarum, Hibiscus rosa sinensis and Cynoden dactylon were added. Bile acids are derivatives of cholesterol and are used as a therapeutic agent for the dissolution of cholesterol gallstones. Cholic acid is one of the bile acids that exhibits polymorphism and intercalation phenomena. Cholic acid was crystallized for the first time in the gel medium. Acetone was used as the solvent for preparing the inner solution. Hydro chloric acid was used as the supernatent solution. Single crystals of different morphology such as prismatic, hexagonal, butterfly and dendritic shaped crystals were formed.
inside the gel within a day. The gel grown crystals were found to have water as the guest inside the crystals and the solution grown crystals were guest free cholic acid. The grown crystals were characterized using single crystal x-ray diffraction, FTIR and thermal analyses. Single crystal XRD analyses showed that the gel grown crystals were monoclinic type while the solution grown crystals were orthorhombic.

5.2 SUGGESTIONS FOR FUTURE WORK

The atherosclerosis plaques consists of cholesterol, cholestryl acetate and phospholipid. Hence the effect of medicinal plants on the crystallization of cholesteryl esters and phospholipids can be studied in detail. Since the gallstones contain calcium carbonate, sodium, magnesium, copper, aluminium, manganese, bismuth, iron and lead, the effect of these ions on the crystallization of cholesterol and its esters can be carried out. The above materials can be co-crystalized with cholesterol and its ester and effect of medicinal plants on the final crystallized material can be studied.