

PREFACE

The advances in solid state science depend greatly on the development of crystal growth techniques. The study of the growth of crystals has assumed enormous importance for both academic research and technology. The range of field involved is also vast: from electronics to metallurgy, from semiconductors to magnetic materials etc. However the general principles of crystal growth can be applied almost right across the board. Studies on the nucleation, growth and properties of crystals are required in the fields like electronics, dielectrics, photonics as well as molecular biology. The studies on nucleation and growth of crystalline deposits in humans play a vital role in medical and pharmaceutical research.

Many minerals and compounds are present in dissolved form in the human body. When the body fluid gets supersaturated with these substances, their crystallization takes place. Crystal deposition diseases are the pathological conditions associated with the presence of crystals which contribute to tissue damage and cause pain and suffering. Some of the major diseases like coronary heart diseases, urinary stones, gall stones, gout etc. are due to the crystallization of different compounds in the body fluid. The study of the strategies to inhibit growth of these crystals is always very relevant.

The crystallization of cholesterol is supposed to be the causative agent for coronary heart diseases and gall stones. The control of nucleation of cholesterol is preferred to curing the diseases caused by the crystallization of cholesterol. This thesis entitled “EFFECT OF PHYTOACTIVE COMPOUNDS ON CHOLESTEROL GROWTH” embodies the results of investigations carried out on cholesterol crystal growth under various experimental conditions and in the presence of some phytoactive compounds.

The objective of this work is to generate knowledge base to achieve a better control on the cholesterol crystal growth, which is a rather ‘unwanted one’, so far as its crystallization in vivo conditions. The control of cholesterol crystal growth is the main aim of this study. The thesis reflects our experience and results drawn from experiments and presenting these ideas with the notion
that it will simplify the problems regarding crystallization of cholesterol. The growth of crystals of cholesterol is studied under varying experimental conditions such as pH, type of acid, concentration of cholesterol in supernatant solution and in the presence of other compounds including plant extracts and light.

**Scope of this thesis**

The author now presents the topics covered in sequence, chapter by chapter. This thesis falls into twelve chapters.

The first chapter narrates the methods of crystal growth along with the details of gel method. A brief description of the theories of nucleation and crystal growth is also given. The second chapter depicts a description of steroids and lipids. The structure of steroids, the description, classification and functions of lipids are discussed here which are related to cholesterol.

The Third chapter illustrates the occurrence, structure, significance, properties, biosynthesis and other aspects of cholesterol molecule.

The important aspects of the branch of science namely phytochemistry which helped to evolve the strategies in controlling the nucleation of cholesterol are presented in chapter four. Here various techniques for the extraction, separation, purification of materials - especially of plant origin - are described. Chapter five starts with a description of the main plant Cassia Fistula Linn. referred to in this work. A vivid description of the constituents of this plant material is elaborated.

In chapter six the experimental techniques for the extraction, separation and identification of phytocompounds in the plant material used in this work is described. Chapter seven is a detailed report on the experimental studies on cholesterol growth in gel medium. This chapter starts with the description of cholesterol crystals and crystallographic details from literature. The experimental studies on the growth of cholesterol crystals under various parameters like pH, electrolytes, concentration of cholesterol solution etc. are presented in detail. The crystals grown in these experiments were characterized with X-ray diffraction studies in this section.
The Eighth chapter deals with the effect of light energy on the nucleation and growth of cholesterol crystals. A detailed study and conclusion on the effect of visible light on the growth of cholesterol crystals is presented in this chapter.

Chapter nine provides a detailed coverage of the experimental study on the growth of cholesterol crystals in the presence of various medicines like lovastatin, Simvastatin, artrovastatin and minerals like calcium and potassium. The qualitative study of the cholesterol crystals grown in these conditions is conducted with the help of UV and IR.

Chapter ten is a significant section where a detailed study of the growth of cholesterol crystals in the presence of crude extract of the flower pigments of the plant Cassia Fistula Linn. is presented. The effect of variation of the concentration of the additive material (CF) both in the presence of light and darkness is presented in detail in this section. The comparative study of the characterization of the grown crystals with the help of XRD, IR and UV is depicted in the latter section of this chapter.

In the Eleventh chapter, the effect of some phytocompounds separated from the crude extract of cassia flowers on the growth of cholesterol is discussed. In the last chapter the conclusion of the study along with future plans is presented.

The glossary is presented in page xi. A detailed bibliography has been presented at the end of each chapter.