AIM AND SCOPE OF THE PRESENT INVESTIGATION
Dictyostelium discoideum has been an important experimental organism for the analysis of fundamental biological processes, including cell migration (Parent and Devreotes, 1999), cell–cell signalling and signal transduction (Parent and Devreotes, 1996; van Es and Devreotes, 1999), phagocytosis (Titus, 2000), signaling during morphogenesis and cell fate determination (Meili et al., 2000). Dictyostelium discoideum has many experimental advantages for studying fundamental cellular processes which includes cytokinesis, motility, phagocytosis, chemotaxis, signal transduction, and many aspects of development such as cell sorting, pattern formation, and cell-type determination. During all these processes cAMP plays a central role. Enormous amount of work has been done related to the role of cAMP during development but there is hardly any report suggesting its role during growth, due to low level of adenylate cyclase activity during growth. The cellular slime mold, Dictyostelium is a highly motile organism and genetically tractable system that can be easily manipulated using biochemical, molecular, and genetic techniques to dissect and understand the regulatory pathways controlling cell growth and development. This allows all the tools of molecular biology, biochemistry, light, and electron microscopy to bring to bear to answer fundamental questions in cell and developmental biology. Most of the processes are very similar to the higher eukaryotic organisms.

Literature survey revealed that enormous amount of work is being done regarding role of cAMP during the development of the Dictyostelium, but there is very little information available on adenylate cyclase involvement during the growth of the Dictyostelium discoideum amoebae. Many aspects of cell proliferation in Dictyostelium are poorly understood, including how individual responds to mitogens and its possible effect during the growth and development. A variety of approaches are being employed to obtain a better understanding the action of these drugs on the physiological aspects of the Dictyostelium.

Many if not most, signaling molecules can be modulated by a wide variety of extracellular signals and can interact directly with and influence the activity of a large number of cellular target proteins. Understanding how individual-signaling
inputs can generate unique cellular responses under these conditions is a major challenge in signal transduction research during growth and development.

Adenylate cyclase on activation produces cAMP from ATP. In order to understand the role of the adenylate cyclase during the growth and development, we selected different known pharmacological agent that modulates adenylate cyclase by either binding to the cellular receptors or through G-protein. In order to have a better understanding about the role of cAMP during the growth and during differentiation we used two drugs namely ISOPROTERENOL and ALUMINUM FLUORIDE. Enzyme activation by isoproterenol takes place through interactions of catecholamines with receptors, which has been known in pharmacological terms as the β-adrenergic receptors in mammalian models. In mammalian system isoproterenol is known to activate adenylate cyclase by binding to adrenergic receptor and thereby transiently increasing cAMP, and the PROPRANOLOL, is known to antagonise the effect of isoproterenol. The biochemistry of the signal transduction system involves the cAMP signalling in Dictyostelium discoideum is remarkably similar to that of β-adrenergic stimulation of adenylate cyclase in higher organisms (Gundersen, et al., 1989). Aluminum fluoride (AlF₄⁻) is known to acts on G-protein, G-protein remains inactive when it is bound to GDP, the AlF₄⁻ mimics the γ-phosphate of GDP resulting in activation of G-protein. Activation of G-protein is closely associated with the activation of Adenylate cyclase. AMINOPHYLLINE are known to inactivate cAMP specific phosphodiesterase (cAMP-PDE) leading to transient increase in cAMP and thereby negatively modulating the activity of adenylate cyclase. Hence it was of our interest to study the effect of different signal transducing pathways affecting the activation of adenylate cyclase.

Keeping the above facts in mind the following studies were undertaken for a better understanding of the role of adenylate cyclase on cell growth and development of Dictyostelium discoideum, our main objectives for the present investigation are as follows:
• To study the effects of adenylate cyclase modulators at the cellular and ultrastructural level using *Dictyostelium discoideum* as a model system.

• To study the effects of the modulators on the growth and the differentiation of this organism.

• The studies on the growth cycle involved analysis on cell division kinetics, endocytotic activities, and protein and nucleic acid syntheses.

• The studies on development of this organism included studies on morphogenetic events such as cyclic AMP chemotaxis, cAMP dependent phosphodiesterase activity, EDTA stable contact formation, aggregate, slug and fruiting body formation.

• Cytomorphological studies using light and electron microscope.