

Research Interests

My areas of interest are the studies of the role of metals in biological systems and the medicinal importance of metal complexes. Main areas of interest are:

1. Medicinal Chemistry of Metals
2. Bioinorganic Chemistry
3. Coordination Chemistry

Synthesis, Characterization of Antidiabetic Complexes:

Diabetes is the sixth leading cause of death in the world. It is associated with several other complications. Main treatments include insulin injections and some oral drugs. Available treatments have several problems such as physical and mental pain due to daily insulin injections and defects involving side effects. In the 21st century, a new class of pharmaceuticals should be introduced. To explore that my groups is involved in synthesis and characterization of metallo-pharmaceuticals containing vanadium. Vanadium complexes have shown promising antidiabetic properties. These vanadium(IV) complexes are characterized in solid and solution state to get an insight into the active species with antidiabetic properties. It is very important to understand the mechanism of the action and structure function relationship of any drug as that information may lead to the design and synthesis of new potent drugs. We, therefore, are working on understanding the mechanistic and structure function relationship of synthesized complexes. To get an insight into action of these complexes, we are involved on synthesis of vanadium complexes with organic ligands with systematic variation of the electron donating and electron withdrawing groups on organic ligand system. To understand the mechanism of action of these complexes as antidiabetic agents, we are involved in conducting comprehensive enzyme kinetic studies with three key enzymes, alpha glucosidase, phosphatidylinositol 3-kinase, and phosphodiesterase, which play an important role in diabetes. These studies may help us in developing vanadium based more potent antidiabetic drugs and will help the scientists working in the fields of chemistry, biochemistry and pharmacology to understand the chemistry of vanadium and the mechanism of the interaction of vanadium complexes with biological agents.

Synthesis and Characterization of Anticancer Complexes:

The fight against cancer remains an ongoing stride and a wide variety of improved as well as new drugs are constantly being subjected to screening. Among the category of new drugs that are receiving much attention are metal-based drugs. To date the compounds of all transition and main group metals have been screened for antitumor properties and many of them are found to exhibit more than marginal activity. Today, there are more than one hundred non-platinum metal complexes that show antitumor activity in one tumor model or the other. Most of these complexes could not enter into clinical trials due to high demands made by toxicology and the criteria of the therapeutic activity that today are prerequisites for clinical studies.

With main group metals most of the studies have focused on organometallic compounds of tin and germanium derivatives. Potential antitumor properties of spirogermanium have been reported which has completed phase II clinical trials. However, it shows both neurotoxicity and pulmonary toxicity. Several transition metals complexes have been studied for their antitumor properties. However, one promising metal is titanium after platinum the complexes of which have shown promising antitumor properties. One of its complex budotitane is in phase II clinical trials. However, interestingly no studies have been reported to see the possible synergistic effects of transition metal coordination complexes and main group organometallic complexes. Synthesis, characterization and antitumor activity studies of these types of complexes may pave its way to a new potent drug for the treatment of cancer because of the synergistic effects of both main group and transition metal complexes. We therefore, are working on the synthesis, characterization and their antitumor studies of new heterobimetallic complexes containing potential anticancer metals, titanium and germanium.