

Polymer Congress 2018: [Co(NN)2Cl]2+ and [Ru(NN)2]2+ complex ion moieties grafted onto the same polymer chain (BPEI): Synthesis, anti-cancer and anti-microbial activities - Arunachalam Sankaralingam - School of Chemistry, Bharathidasan University, Tiruchirappalli – 620024, Tamil Nadu, India.

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Grafting metal complexes into cationic polymers like branched polyethylene imine (BPEI) is an interesting area of research in medicinal chemistry. Various metal complexes such as copper, cobalt and ruthenium 3 grafted BEPI with anticancer and antimicrobial activity have been reported. Due to cooperative effect, as degree of coordination increases metal complex units present in the polymer increase. It increase the overall binding affinity of each metal chelate unit to biomolecules there by its produce effective cytotoxicity with various metastatic and non-metastatic cancer cell lines. Compared with one metal system bimetal systems are more effective in biomolecule interaction and biological properties due to synergic effect. Therefore in this work both cobalt and ruthenium containing polypyridyl ligand complexes grafted on the same BEPI have been synthesized and characterized with various spectroscopic techniques. Their degree of coordination has been determined by atomic absorption and atomic emission spectroscopy. The key features of these complexes are highly stable, redox active and show a quasi-reversible in the cyclic voltammetry response. The cell proliferation and mode of cell death induced by polymer-metal complexes in breast cancer cells, MCF-7 were determined using MTT assay.

The inhibitory concentration 50% for these complexes are in nano molar range. It clearly indicate that these bimetallic polymeric drug conjugate is very effective against MCF-7. The in-vitro staining techniques is used to conform the mode of cell death via apoptosis. Beside their antimicrobial susceptibility of few bacterial and fungi strains were determined by the zone of inhibition method. Cancer has been the most deleterious disease in recent times, and unfortunately its spread is increasing. Taking into account this grave health situation, scientists are trying to develop novel carriers for anticancer drug delivery specifically aimed at cancer tumors. Millions of people are diagnosed with cancer globally each year, and more than a half of

them die. Every year, the American Cancer Society estimates the numbers of new cancer cases and deaths that will occur in the USA and compiles the most recent data on cancer incidence, survival, and mortality. In 2019, 1762.450 new cancer cases and 606.880 cancer deaths are projected to occur in the USA. From 2006 to 2015, the cancer incidence rate was stable in women and declined by approximately 2% per year in men, whereas the cancer death rate from 2007 to 2016 declined annually by 1.4% and 1.8%, respectively. A broader application of existing cancer control knowledge with an emphasis on disadvantaged groups could possibly accelerate progress toward finding a cure for cancer. Following cardiovascular diseases, cancer is the second-most prevalent cause of death in the world. Globally, about 20% of cancer patients suffer from breast cancer. It is a group of diseases that involve the uncontrolled proliferation of cancer cells. The most used treatments against cancer are radiotherapy, chemotherapy, immunotherapy, hormonal therapy, and surgery. Chemotherapy, a cancer treatment based on using drugs (chemicals), is one of the most important techniques in treating tumors, along with surgery and radiation. The drug resistance of cancer cells is one of the major challenges in chemotherapy. Simultaneous delivery of two or more therapeutic agents has received much attention recently because it may produce better anticancer results. Polymer nanocomposites offer numerous opportunities in diverse applications, including nanocarriers, tissue engineering, antimicrobials, sensors, etc. These new groups of materials have gained significant research interest due to their novel properties, which are gained through the addition of nanofillers. Polymer nanocomposites have significant potential in disease theranostics, and nanotechnology brings great promise in cancer drug carriers. Chemotherapy implies the use of drugs and, besides the drugs, carriers. Common products used as carriers

include synthetic polymers, biopolymers, and polymer nanocomposites.

Some of the most useful drugs for chemotherapy are toxic chemicals able to inhibit the proliferation of cancer cells. The use of chemotherapeutic drugs has been in part hindered by their poor solubility in water, their short biological half-life, their lack of targeting ability, and the development of multidrug resistance. In the last decades, nanoparticles have shown significant promise as an oncology treatment modality. Responsive polymers represent a promising class of nanoparticles that can trigger delivery through the exploitation of a specific stimuli. Response to a stimulus is one of the most basic processes found in living systems. A tutorial review highlighted the recent developments in polymer-based approaches to internally responsive nanoparticles for oncology. One important goal of medicine is to develop carriers that can selectively deliver anticancer drugs to tumor cells with no or minimal side effects in healthy cells. Polymers and their nanocomposites in different forms, such as micelles, hydrogels, polymersomes, and liposomes, have

important potential in cancer diagnosis and treatment. Nanocomposites are popular in many areas due to properties such as their unique design capacity, eco-friendly nature, easy production, and cost-effectiveness. In composites, interactions between the polymer matrix and the nanofiller are critical in determining the properties of the hybrid structure. Polymers that respond to various stimuli offer a drug delivery platform at a controlled rate and in a stable and biologically active form. Among the many cancer-fighting chemicals that are often used is DOX (Doxorubicin or Adryamicine), which is 4-substituted-2,5-dimethoxyamphetamine: it is a commonly used drug widely applied in combination with other chemotherapeutic agents for the treatment of some leukemias and lymphomas, multiple myeloma, and cancer of the bladder, stomach, breast, ovaries, lung, and thyroid. However, small doses of DOX administered over a period of several months raise the incidence of life-threatening side effects such as cardiomyopathy, with myelosuppression and acute bowel infection.