Cancer is one of the most prevalent diseases of our time. It is estimated that more than 10 million people developed a malignant tumor and more than 6.5 million people died from this disease worldwide during the year 2000. In the United States alone, cancer is the second cause of death from disease after heart disease, accounting for more than half a million annual deaths. The economic burden associated with cancer-related medical costs and loss of productivity in the United States has been estimated to be close to $190 billion per year. The rate of cancer mortality in the Unites States increased during most of the past half century; however, overall cancer death rates have declined since approximately 1993, possibly as a result of achievements in the areas of prevention, early detection, and treatment[3]. Nonetheless, when compared to the fall in mortality rates that has been observed for other major chronic diseases –such as heart and cerebrovascular disesase— in the United States during the past 50 years, the decrease in cancer-associated death rates has been minimal.

Chemotherapeutic agents in general lack specificity because they act on all proliferating cells by inhibiting DNA synthesis or interfering with processes of cell division and metabolism. As a consequence, chemotherapy leads to the damage of healthy cells, especially of the normally dividing cells of the bone marrow, skin, and gastro-intestinal mucosa. In addition, neoplastic cells readily mutate, and many cancers develop resistance to chemotherapeutic agents. The need for improved therapies for the treatment of cancer is still great, and one of the strategies that is currently being investigated to improve patient outcomes is the development of engineered delivery systems that improve the pharmacological characteristics of antineoplastic drugs *in vivo*. For cancer treatment, specifically, these drug delivery systems aim to increase the

therapeutic efficacy of the chemotherapeutic agent while minimizing its interaction with non-pathological sites in the body by modifying its biodistribution and controlling the rate at which the agent is released from the carrier to the systemic circulation or tissues. The design and consequent physiochemical properties of the drug carrier determine the results observed *in vivo*.

Injectable drug carriers that have been used for the controlled delivery of chemotherapeutic agents include liposomes, micelles, prodrugs, microparticles, and nanoparticles. Numerous biopolymers, both synthetic and natural, have been utilized for drug delivery applications. As for any other device destined for *in vivo* applications, drug delivery systems must result in low or preferably non-detectable adverse physiological interactions such as immunogenicity and toxicity. Synthetic polymers have a number of benefits compared to natural polymers including high control of polymer properties, such as molecular weight and functionality, and feasible commercial scale production. In addition, although both synthetic and natural polymers may activate the complement system, natural polymers may lead to cellular and humoral immune response as a result of the recognition of foreign organism markers.

The work described in this presentation will include some from our own research lab or targeted delivery of chemotherapeutic and imaging agents as well as work from other labs on targeting to cancer through angiogenesis, using folate receptors and targeting to specific cancer types.