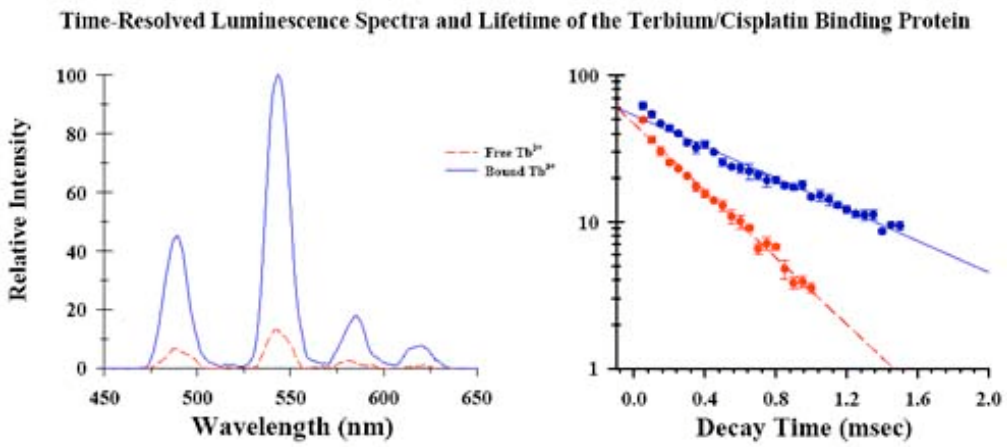
Robert G. Canada, Ph.D.
Molecular and Cellular Biophysics

The Laboratory of Biophysical Cytochemistry is unique in its capacity to conduct cancer-related research from a biophysical point of view. The long-term goal of the Laboratory is to determine the molecular and cellular mechanism of cisplatin resistance. Development of cisplatin resistance by the cancer cell is one of the major problems in treating patients with cisplatin chemotherapy. The Laboratory has established that terbium can reverse cisplatin resistance in human cancer cells, expressing the defective accumulation phenotype. The central hypothesis of this research is that a specific terbium/cisplatin binding protein plays a key role in the transport of cisplatin across the plasma membrane. This theory is based on research data produced by our laboratory.



The Laboratory of Biophysical Cytochemistry utilizes electrothermal atomic absorption spectrophotometry and microfluorometry to measure the cellular accumulation and cytotoxicity of cisplatin, respectively. Time-resolved luminescence spectroscopy is used to determine the equilibrium and stoichiometric binding of terbium, as well as to characterize the molecular structure of the terbium/cisplatin binding protein. The Laboratory is evaluating the relative contribution of cisplatin accumulation to the cytotoxic activity of cisplatin in human breast, ovarian and prostate cancer cells. Recently, we have embarked on a series of experiments involving cancer nanotechnology. Nanotechnology offers tremendous opportunities to advance the

diagnosis, treatment and prevention of cancer. Our strategy is to specifically target cancer cells, and deliver cisplatin to the cells without harming healthy cells. We have developed a multifunctional nanoparticle that is capable of locating and killing cancer cells.