Jayne Robinson (Department of Biology) and Shawn Swavey (Department of Chemistry)

Title: Novel Treatments in the Fight Against Antibiotic Resistant Microbes and Lung Cancer

Abstract

Supramolecular, broadly defined, is composed of an ordered aggregate of molecules, and therefore, encompasses many aspects of science and engineering. As such, supramolecular science serves as an excellent platform from which scientists and engineers from a variety of backgrounds can come together to solve some of societies greatest problems. The work presented here is born out of this collaborative effort in which Professor Jayne Robinson (microbiologist) and I (inorganic chemist) are developing novel compounds capable of treating antibiotic resistant microbes. For the past several years hardly a week goes by without the media coverage of an apocalyptic scenario of a world without antibiotics. Even medical professionals are sounding the alarms as some are claiming that we are entering into a post-antibiotic era where the slightest bacterial infection could result in unimaginable consequences. The research that Professor Robinson and I will present describes a novel compound which has shown a remarkable ability to kill a variety of bacteria. In addition, a very small quantity of this compound, taken in conjunction with known antibiotics, shows the potential to kill bacteria that were once resistant to that antibiotic. Another topic we will describe is work that is in collaboration with an oncology group at Wake Forest Medical School. This research describes the use of our compounds as potential photodynamic therapy agents in the treatment of lung cancer. Photodynamic therapy is a non-invasive treatment modality which requires a photosensitizer, molecular oxygen, and light to induce cell damage. Preliminary studies indicate that at extremely low concentrations (nanomolar) our complexes are capable of inducing complete cell death (A549 lung cancer cell line) when irradiated with low energy light for 10 minutes. Both the antimicrobial activity and the light induced cancer cell killing are a function of the supramolecular interaction of the compounds with cellular DNA. The work we will present is but a small sample of the research that is coming out of our newly proposed center for SupraMolecular Applied Research and Technology which has already garnered interest from bioengineers, biologists, chemists, chemical engineers, and physicists here at the University of Dayton. The hope of this center is to take advantage of existing expertise on campus with the idea of taking research from the bench top to application.