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Dr. Amiji received his undergraduate degree in pharmacy from Northeastern University in 1988 and his PhD in pharmaceutics from Purdue University in 1992. His areas of specialization include polymeric biomaterials, advanced drug delivery systems, and nanomedical technologies.

Dr. Amiji's research interests include synthesis of novel polymeric materials for medical and pharmaceutical applications; surface modification of cationic polymers by the complexation-interpenetration method to develop biocompatible materials; preparation and characterization of polymeric membranes and microcapsules with controlled permeability properties for medical and pharmaceutical applications; target-specific drug and vaccine delivery systems for gastrointestinal tract infections; localized delivery of cytotoxic and anti-angiogenic drugs for solid tumors in novel biodegradable polymeric nanoparticles intracellular delivery systems for drugs and genes using target-specific, long-circulating, biodegradable polymeric nanoparticles; gold and iron-gold core-shell nanoparticles for biosensing, imaging and delivery applications. His research has received sustained funding from the National Institutes of Health (NIH), National Science Foundation (NSF), foundations, and local industries.

Dr. Amiji is currently Professor and Interim Chair of Pharmaceutical Sciences Department and Co-Director of Northeastern University Nanomedicine Education and Research Consortium (NERC). NERC oversees a doctoral training grant in Nanomedicine Science and Technology that was co-funded by the NIH and NSF. He has three published books, *Applied Physical Pharmacy* (McGraw-Hill, 2003), and *Polymeric Gene Delivery: Principles and Applications* (CRC Press, 2005), and *Nanotechnology for Cancer Therapy* (CRC Press, 2007) along with over 150 book chapters, peer-reviewed manuscripts, and abstract publications. Dr. Amiji has received a number of awards including the 2006 NSTI Award for Outstanding Contributions towards the Advancement of Nanotechnology, Microtechnology, and Biotechnology and the 2007 American Association of Pharmaceutical Scientist's Meritorious Manuscript Award.

Dr. Amiji has supervised research efforts of over 60 post-doctoral associates, doctoral and master's level graduate students, and undergraduate honors students over the last 15 years. His teaching responsibilities are in Doctor of Pharmacy (Pharm.D.) program and graduate programs (M.S. and Ph.D.) in Pharmaceutical Sciences, Biotechnology, and Nanomedicine.

MULTI-FUNCTIONAL NANOSYSTEMS TO OVERCOME TUMOR DRUG RESISTANCE

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Abstract

There has been tremendous recent interest in nanotechnology application for cancer prevention, diagnosis, and treatment. In cancer therapy, overcoming biological barriers and target specific delivery are the key challenges. Furthermore, newer generation of molecular therapies, such as gene therapy oligonucleotides, and RNA interference, will require intracellular delivery strategies for effective outcomes.

Due to lack of efficient systemic drug delivery and microenvironmental selection pressures, development of drug resistance is a major challenge in effective cancer chemotherapy. Multidrug resistance is known to develop for both conventional cytotoxic chemotherapy as well as the newer generation of biological therapies. Our multi-pronged strategy to overcome tumor resistance is based on enhancement of drug delivery efficiency and to affect cellular phenotypic alternations that can enhance cell-kill efficacy.

In this presentation, I will provide an overview of our work over the last several years on the use of combination cytotoxicity and intracellular ceramide modulation, combination heat and drug therapy, and *mdr-1* gene silencing work using small interfering RNA. Each of the above strategies utilizes nanotechnology-based delivery systems made with biodegradable and biocompatible polymers and lipids. Thorough understanding of the biological problem, ease of technology development and scale-up, and judicious selection of safe materials are some of the critical issues that we have incorporated in our research for rapid clinical translation of these technologies for benefit to cancer patients.