

PHARMACEUTICAL SCIENCES

The University of Puerto Rico, School of Pharmacy at the Turn of the New Millenium

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As we enter the new millenium, it behooves us, as academicians and educators entrusted with the preparation of future generations, to reflect on our responsibilities and how to meet the needs of our society. The School of Pharmacy of the University of Puerto Rico, despite its small size of thirty full-time faculty, has graduated most of the pharmacists who work as health providers and in the pharmaceutical industries in Puerto Rico.

For the past several years, the faculty of the School of Pharmacy were engaged in a major curricular revision of the professional program, that led to the implementation, during this academic year, of the Doctor of Pharmacy program (Pharm. D.) to replace the B.S. in Pharmacy program. The essence of the Pharm. D. program, brought about by the changes within the Health Care System among other factors, is to prepare students with the abilities to foster the scope of contemporary practice, as well as to embrace the emerging roles that ensure the rational use of drugs in the individualized care of patients, and populations. The increasing complexity of modern drug therapy calls for the pharmacist to serve not as a 'pill counter', but as an expert in drugs who fulfills an active vital role within the team of health-care providers. Current standards for accreditation by the American Council on Pharmaceutical Education also require this change.

In addition to the professional program, the School of Pharmacy offers a graduate program leading to a Master of Science in Pharmacy. At present, the degree is offered in two areas of need to the pharmaceutical industries within the Island: Industrial Pharmacy and Pharmaceutical Sciences (Medicinal Chemistry). The program is especially geared to individuals who can enroll as full time or part-time students, and would like to advance their scientific and professional career.

Puerto Rico has one of the highest densities of drug manufacturing plants in the world. Practically all major

pharmaceutical companies within the U.S.A., and several from other countries, manufacture some or all of their products in the Island. In order to maintain their complex infrastructure, a highly skilled labor force has to be trained and maintained.

The pharmaceutical industry of Puerto Rico constitutes an important economic sector. It is precisely for this reason that the government of Puerto Rico, aware of the fierce global competition to attract these industries elsewhere, has adopted a science and technology policy which gives incentives to the companies to invest in preparing the needed labor force through education and training. The new policy highly encourages interactions between the industry and academia. The University of Puerto Rico (UPR), being the leading institution for higher education in the Island, has been entrusted with taking the leadership role in the implementation of the new policy. This implies that the University has to shoulder the responsibility for training future generations of scientists, not only in the manufacturing aspects of drugs, but also in the drug discovery, research and development, which ultimately will be the cornerstone for maintaining a viable and highly competitive industrial complex within the Island.

The faculty at the School of Pharmacy are fully aware of the critical role that the School has to play in the whole initiative. Accordingly, in the professional Doctor of Pharmacy program, unlike most of the Schools of Pharmacy in the United States, where the focus on Industrial Pharmacy courses has been substantially reduced, the new curriculum of Pharm. D. has maintained and even increased its emphasis on Industrial Pharmacy, as well as on the other basic pharmaceutical sciences, including Medicinal Chemistry and Pharmacology. Rotations within the pharmaceutical industries and other non-traditional scenarios have also been added as options in the new curriculum. Internships and scholarships within the industries, offered to our students, afford additional opportunities to learn and gain practical experience within the industry.

The School of Pharmacy is currently a member of the Center for Pharmaceutical Processing Research, which is one of over fifty Centers of Excellence (and the only Center

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devoted to manufacturing processes in pharmacy) supported by the National Science Foundation (NSF). This Center is a consortium between Purdue University, the University of Connecticut, University of Minnesota and the University of Puerto Rico, under the leadership of their respective Schools of Pharmacy. Each School has satellite Pharmaceutical Companies in partnership which funds research proposals submitted by the faculty of the four Universities related to areas of interest to the member Companies. Funding of the proposals is decided by an industrial advisory board based on scientific merit and needs of the industry. The research is carried out by faculty and graduate students from the four Universities. A reviewer for the NSF monitors the activities of the Center and ensures that it meets the expected scholarly standards. As a result of joining this Center, our graduate students in Industrial Pharmacy, are wonderfully enriched by participating in the meetings held in rotations at the Universities, where they present their work and share their experiences. Through the Center, the member Companies ensure that the graduate students are trained in areas that meet their needs. An added advantage to the Companies is that, for a modest contribution, each member Company shares the benefits of the collective research effort.

The School of Pharmacy is planning to offer a Ph.D. program starting with Industrial Pharmacy and Medicinal Chemistry. The new faculty being recruited to fill current vacant positions in the Department of Pharmaceutical Sciences are carefully selected among candidates with a strong commitment both to teaching and research.

With this vision in mind, the School of Pharmacy organized on March 26 & 27, 1998 the *First Symposium on Drug Discovery, Commercialization and Economic Development* at the Condado Plaza Hotel in San Juan. The objective of the symposium was to acquaint and educate key personnel, within the Government of Puerto Rico and the Universities in the Island, about the vital need to support the establishment of a Research Institute within the University of Puerto Rico, where high quality research in this complex area, as well as the training of interested

and qualified students, can be carried out. It is our firm belief that the establishment of this Institute is vital for Puerto Rico to create the brain power that will enable the Island to maintain its competitive edge within the global pharmaceutical market in the 21st century. The proposed Institute is intended to serve as a focal point for the research activities in pharmaceutical sciences within the projected doctoral program of the School of Pharmacy.

Since the topics presented in the symposium are of current interest to the scientific community, we are publishing four of them in this issue. These are the contributions made by the following speakers:

Dr. George Albers-Schöenberg, Former Executive Director of Natural Products Chemistry at Merck Sharp & Dohme who spoke on *Global Trends in The Pharmaceutical Industry*; Dr. James D. McChesney, Chief Scientific Officer, Natural Products, NaPro BioTherapeutics, Inc, Boulder, Colorado who gave a talk on *Natural Products in Drug Discovery – Organizing for Success*, as well as Dr. Gordon M. Cragg, Chief, Natural Products Branch, Developmental Therapeutics Program, Division of Cancer Treatment and Diagnosis at the National Cancer Institute, who presented a paper entitled *Natural Product Drug Discovery and Development: The United States National Cancer Institute Role*, and Dr. Richard B. Greenwald, Associate Vice President, Organic & Medicinal Chemistry, Enzon, Inc., Piscataway, New Jersey, whose paper was entitled *Poly (ethylene glycol) Anticancer Drug Delivery Systems*. The emphasis on natural products, as potential source for drug discovery, reflects the unique advantage that Puerto Rico has to provide new leads, from its rich natural resources, that can be exploited in the discovery of drugs by the Pharmaceutical Industries within the United States.

Through its dedicated faculty and staff, the School of Pharmacy of the UPR will continue to undertake its leadership role in providing highly qualified and trained pharmacists and scientists, who will serve the health needs of the community and contribute to the economic growth and development of the Island.