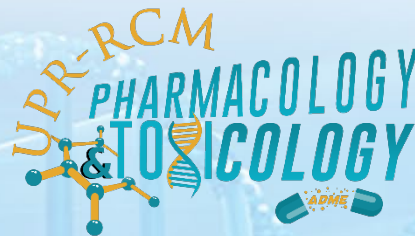




UNIVERSITY OF PUERTO RICO | MEDICAL SCIENCES CAMPUS | SCHOOL OF MEDICINE

Department of Pharmacology and Toxicology

Application deadline: December 1, 2022
<https://md.rcm.upr.edu/biomed/>



Pharmacology Department Webpage
<https://md.rcm.upr.edu/pharmacology/>

Join us in developing the next generation of Pharmacologists for Puerto Rico



Contact Information

UPR Department of
Pharmacology and
Toxicology

(787) 766-4441

<https://md.rcm.upr.edu/pharmacology/>

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What is a Pharmacist?

- A **PHARMACOLOGIST** is a scientist with the knowledge to investigate disease mechanisms and to discover and develop drugs that may be useful in treating diseases
 - Based on knowledge of Biochemistry and Physiology
- **TOXICOLOGY** is the study of the adverse or toxic effects of drugs and other chemical agents: The TOXI Program is being revised, and currently not accepting students



A future pharmacologist in the year 2000!!



Program Description- PhD program

- Years 1-2: Take courses:
 - Cellular and molecular biology, anatomy, biochemistry, physiology, pharmacology, biostatistics, research ethics, and more.
 - They also develop skills in the critical analysis of the scientific literature and oral presentation
- 2nd-3rd year: Transitional
 - Identify a Dissertation Advisor
 - Pass the qualifying examination
 - Write the research proposal
- 3-5th years:
 - Experiments, meetings with the thesis committee and thesis director
 - Write and defend the thesis
 - GRADUATE



Program Description- MS program: 2-3 years

- Years 1-2: Take courses:
 - Cellular and molecular biology, anatomy, physiology, pharmacology, biochemistry, biostatistics, research ethics, and more.
 - Develop skills in the critical analysis of the scientific literature and oral presentation
- Identify Thesis research advisor
 - Develop MS proposal
 - Experiments
 - Defend
- Graduate: No more than 3 years



Profile of the Graduate

The PhD or MS graduate in Pharmacology will have the knowledge, skills, and attitudes necessary for excellence in:

- **Teaching** Medical Pharmacology and Toxicology in educational and professional institutions, in and outside of Puerto Rico.
- **Scientific investigation**, in academic, governmental, or private centers, possessing the skills and capabilities necessary for participating in research projects
- **Private industry**, as consultant or leader of projects related to research and development, production, manufacturing, and quality control laboratories
- In **public service or government**, as consultant, trainer, administrator, or advisor to agencies or laboratories responsible for supervising matters of health or quality control, among others.

MS or PhD?

- PhD is usually required to obtain research funding from the National Institutes of Health (NIH) and for many, not all, university teaching jobs.
- The MS graduate has the necessary technical skills to be a lab manager or work in many levels of Industry, as well as the knowledge to teach or work in public service



Department of Pharmacology and Toxicology

Toxicology

Recent Graduate Outcomes: 2000-

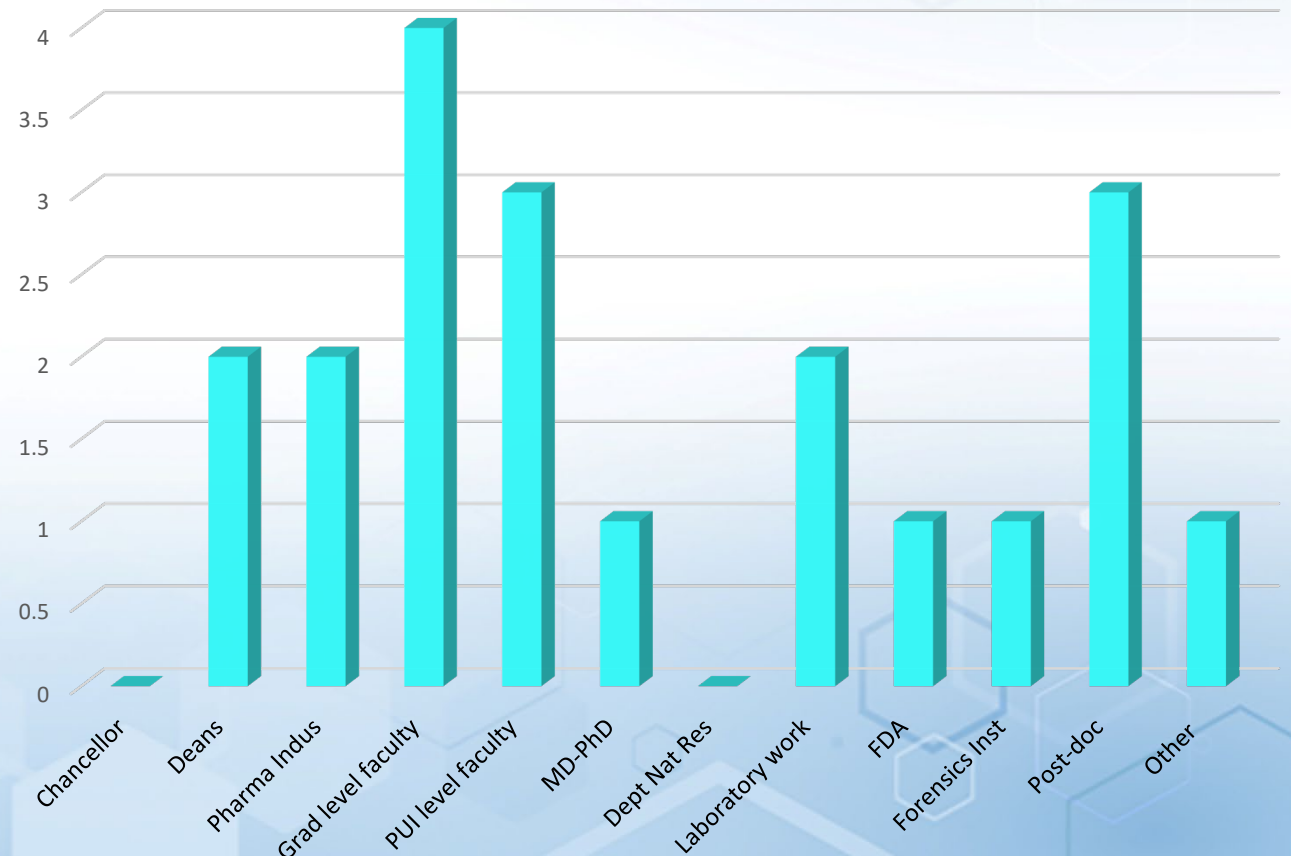
Where do Pharmacologists Work? 21

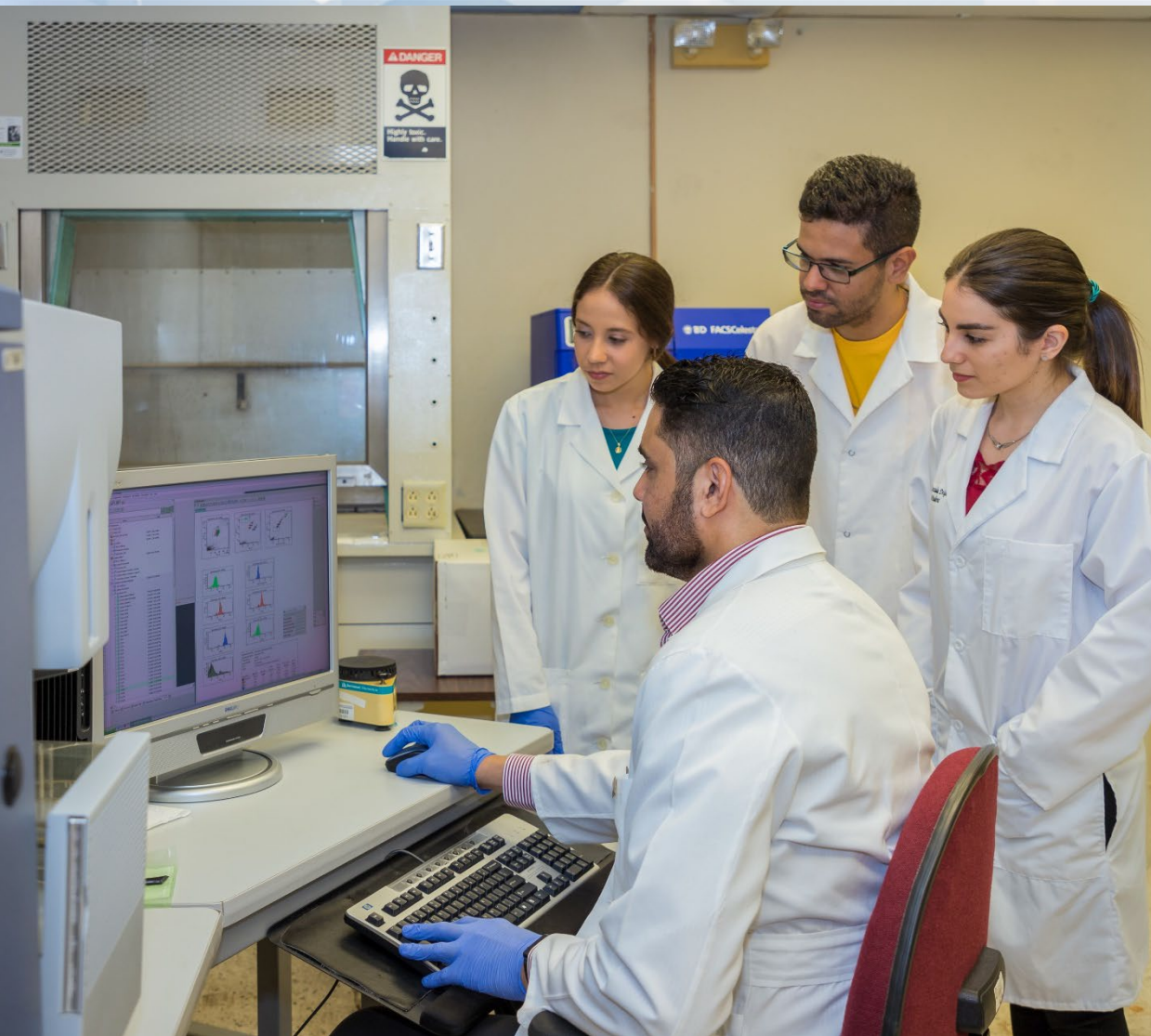
- Research and Academia
- Pharmaceutical industry
- Regulatory Science and Public Policy
- Administrative positions in government
- Private Foundations

Department webpage

- <https://md.rcm.upr.edu/pharmacology/>

Employment of Graduates 2000-2021





The graduate program is designed to develop “Core Competencies”

RESEARCH SKILLS

- Have a knowledge of the theoretical base and practice of the basic science methodology related to the area of specialization within the field of Pharmacology and Toxicology.



CAREER DEVELOPMENT SKILLS



- Demonstrate the ability to identify strengths and weakness, mentor others and network.
- Develop skills to promote their own career development as an independent scientist.
- Prepared for employment in Academia or Industry

COMMUNICATION SKILLS

- Have the skills of presentation and publication of scientific work in local, national, and international forums. This includes writing of reports, oral presentations, poster presentations, and publication in scientific journals.



CRITICAL THINKING

- Be able to examine, develop and critically evaluate scientific questions, presentations and the literature including such aspects as the framing of the research question, logic of the research design, and appropriate use of statistical tools.



PROFESSIONALISM AND RESPONSIBLE CONDUCT OF RESEARCH

Professionalism

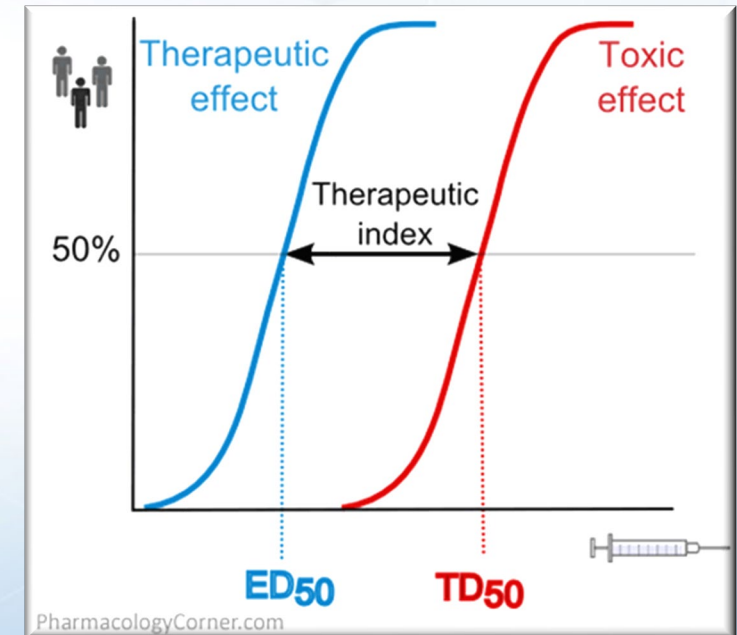
- Objective
- Critically analytical
- Inquisitive,
- Solving scientific problems
- Evaluating new knowledge
- Establishing public policy relating to Medical Pharmacology

Responsible conduct of research

- Scientific rigor and reproducibility
- Consider biological variables: sex, age, weight, health conditions
- Authenticate key biological and/or chemical resources

DISCIPLINE-SPECIFIC CONCEPTUAL KNOWLEDGE:

- A mastery of the basic principles that underlie **Medical Pharmacology and Toxicology**
 - Especially **Pharmacokinetics and Pharmacodynamics**,
 - Systemic Pharmacology: Actions of drugs in all organs
 - All these preclinical concepts are based on Biochemistry, Physiology, Biochemistry and Anatomy



Pharmacology Graduate Program

M.S. Degree: 3 yrs

- 24 course credits
 - Biochemistry
 - Physiology
 - Pharmacology
 - Biostatistics
 - Lab rotation
 - Seminars
- 6 credits of thesis

Ph.D. Degree: 5-6 yrs

- 45 course credits
 - Biochemistry
 - Physiology
 - Pharmacology
 - Biostatistics
 - Lab rotation
 - Electives in Pharmacology, Biochemistry and Physiology
- 15 credits of thesis
- Comprehensive qualifying examination

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Department webpage

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Logros de los Estudiantes-2022 (*parcial*)

Papers published

- Angiotensin induces differentiation of **neuroblastoma cells**
- Low frequency variants at the CYP2C9 locus among **Puerto Rican patients** on warfarin: in silico predictions of functionality and conservation. Pharmacogenomics

Book chapters:

- Chapter Title: “Aging, oxidative stress, **mitochondrial dysfunction**, and the liver.” Book title: **Aging: Oxidative Stress and Dietary Antioxidants**. 2nd Edition. 2020. Edited by: Victor R. Preedy

Abstracts

- Plasma Exosomes from **HIV-Seropositive Patients** with Cognitive Impairment Increase sIR and HIV-1 Tat Levels in Monocytes from Healthy Donors.
- TNF-alpha Mediates Phosphorylated P38 MAP Kinase and AKT1 Secretion in **Astrocyte**-Derived Exosomes
- Losartan Inhibition of Angiotensin II Improves Metabolic Biomarkers in **Prediabetic Rhesus Monkeys (Macaca**
- A Novel Procedure for the Quantitative Recovery of **Small Intestine** Intraepithelial Lymphocytes
- Dysregulated endonuclease activity of **human and mouse** apurinic/apyrimidinic endonuclease 1 is associated with mitochondrial DNA damage in **Huntington's disease**.

Grants awarded

- **NIH, R36:** Effects of losartan on mitochondria and prediabetes in rhesus monkeys (*Macaca mulatta*).

Internships and Special Awards

- Graduate Summer Internship research: National Institutes of Health – **National Cancer Institute**.
- ASPET Mentoring Network: Coaching for **Career Development program**
- **Eli Lilly Drug** Discovery and Development **PhD Internship** (Fall 2020)
- **Woods Hole course** "Physiology: Modern Cell Biology Using Microscopic, Biochemical and Computational Approaches
- **Summer training program in Clinical Research** at **Washington University, St Louis, Mo**

New Investigator scholarship:

- PHENOTYPIC CHANGE OF MONOCYTES INDUCED BY PLASMA EXOSOMES FROM **HIV(+)** **WOMEN** WITH HA ND” was accepted to be presented as a Spotlight at *virtual* Conference on Retroviruses and Opportunistic Infections (vCROI 2021)



Our Department



Who we are?

- **Pharmacology & Toxicology Department**

- 9 PhD Students
- 7 faculty members
- 3 faculty Ad honorem
- Associated labs:
 - 3 students in collaborating labs outside the department



UNIVERSITY OF PUERTO RICO | MEDICAL SCIENCES CAMPUS | SCHOOL OF MEDICINE

Graduate Faculty and Research Interests



Yamil Gerena, Ph.D. Professor and Chair Ph.D. 2005, University of Puerto Rico

Accepting new
students

Research Interests:

- Mechanisms of Insulin Resistance and Cognitive Impairment in HIV and Alzheimer's disease
- Flow cytometry as a revolutionary technology for drug discovery, receptor pharmacology, drug binding assays, and high-throughput screening

Laboratory Team



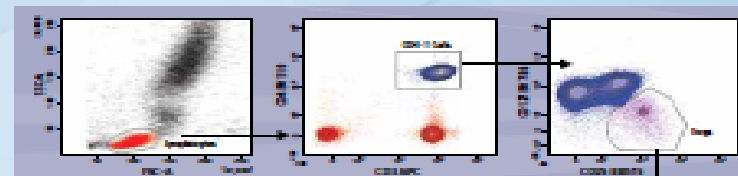
UNIVERSITY OF PUERTO RICO | MEDICAL SCIENCES CAMPUS | SCHOOL OF MEDICINE | DEPARTMENT OF PHARMACOLOGY AND TOXICOLOGY

Flow Cytometry Facility:

Basic
Training



Multicolor Analysis



Cell Sorting

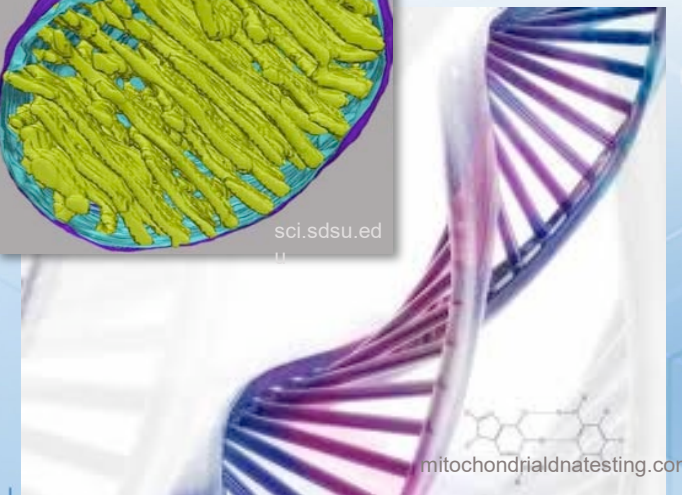
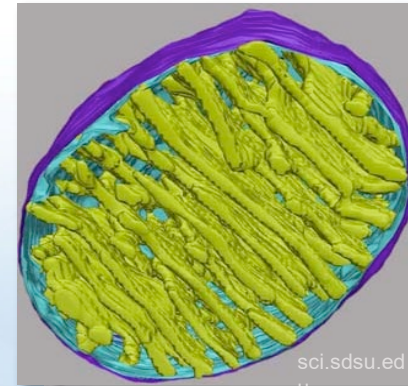




Sylvette Ayala-Peña, Ph.D.
Associate Professor
Ph.D. 1998, University of Texas
Medical Branch

Accepting new
students

- Mitochondrial DNA repair and mitochondrial bioenergetics
 - Huntington's disease
 - Aging and metabolic disease
- Therapeutic interventions

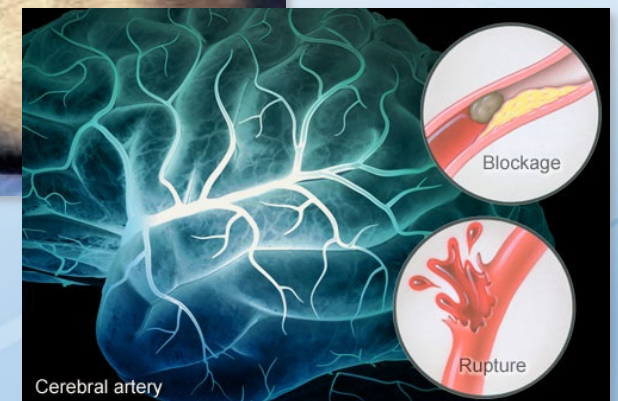
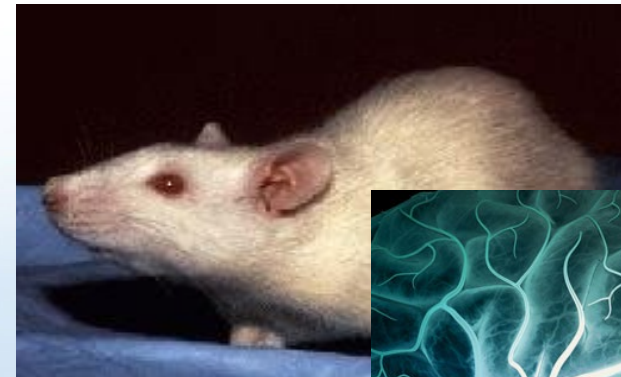




A. Henrique Martins, Ph.D.
Associate Professor, Ph.D
University Federal of São Paulo, Brazil

Accepting new
students

- Neuroprotection after stroke
- Molecular basis of differentiation of rat neural progenitor cells
- Modulation of blood-brain barrier by stable peptides





Ingrid M. Bonilla PhD
Assistant Professor (Ad honorem)
Veterans Hospital
PhD, The Ohio State University

New faculty member

Bench side

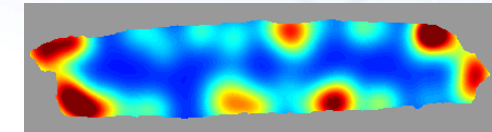


Bed side

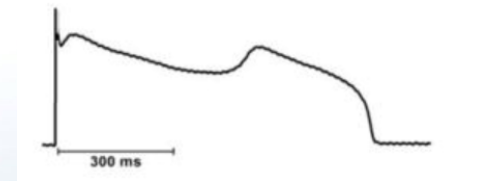
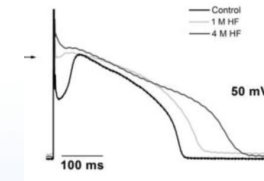
I am interested in studying the mechanism of cardiac arrhythmias, find new drug target and design new and innovative treatment strategies for the treatment of cardiac diseases, by using animal models and clinical studies.

Techniques to be used:

Confocal Ca imaging



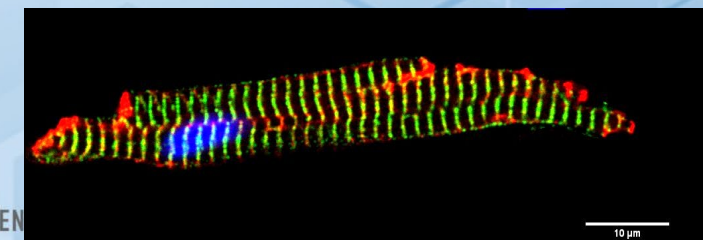
Single cell electrophysiology : Patch clamp



ECG recordings



Immunohistochemistry





Emma Fernández-Repollet, Ph.D.

Professor

Ph.D. 1979
University of Puerto Rico

- 3-D Printing as an Educational Tool in Biomedical Research
- Biomedical Workforce Development
- Health Disparities Research in Hispanic Populations



The BioMedical Innovation Center



TECHNOLOGY

3D PRINTING
Filament & Resin
3D SCANNING
CT & MRI
SEGMENTATION

PRODUCTS

Prosthetic Hands
Custom Neuro-devices
Molecule Structures
Organs and Viruses
Models

TRAINING

Undergraduate
High School
Middle School
Students

Visit us at: <http://bil.rcm.upr.edu>



Emma Fernández, Ph.D.
Professor & Executive Director



Abe Schwartz, PhD
Professor & Scientific Director



Ricardo Nieves, BS
Bioinformatician

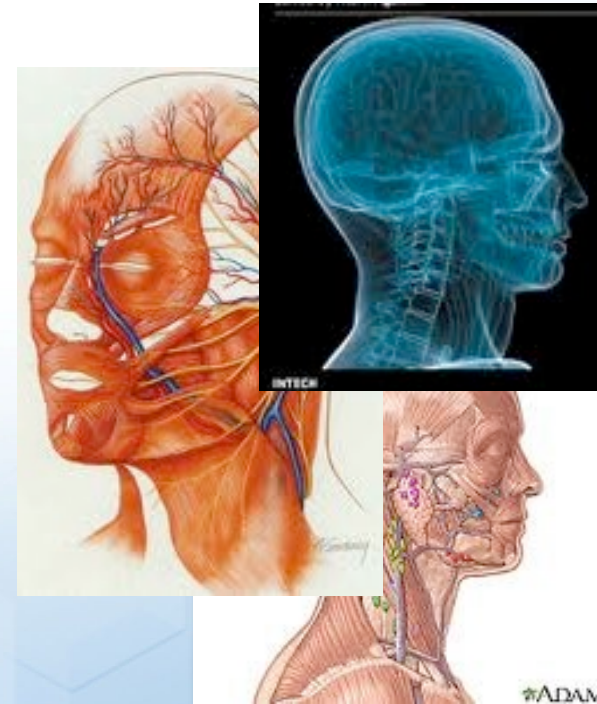
Adriana Báez, Ph.D.

Professor

Ph.D., Universidad Autónoma de Madrid



- Research interests
 - The molecular, epidemiological, and clinical characteristics of head and neck cancer in Puerto Ricans
 - Understand the impact of specific factors in mentoring relationships that account for diverse young faculty developing as successful scientists across STEM
- Research Director in the Otolaryngology – Head and Neck Surgery Department



José G. Ortiz, Ph.D.

Professor

Ph.D. 1982, University of Connecticut

- Neuroactive properties of natural products

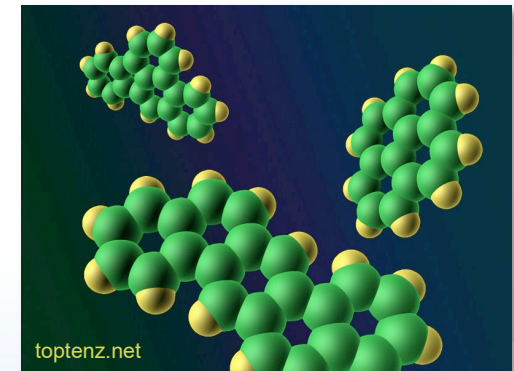


Diógenes Herreño, Ph.D.

Associate Professor

Ph.D. 1986, University of Puerto Rico

- Chemical carcinogenesis of aromatic polycyclic hydrocarbons, aromatic amines
- Identification and characterization of biomarkers
- Genetic toxicology of natural products

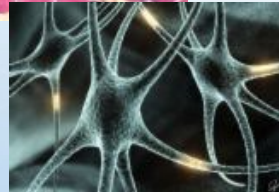


Some techniques used by researchers in the Pharmacology and Toxicology Department.

Studies of stroke



Cell Culture



Western blot

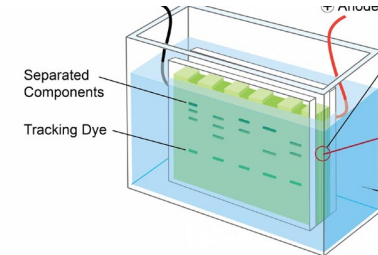


Diagram 1: Illustration of Western Blot Setup.

Mitochondrial energetics



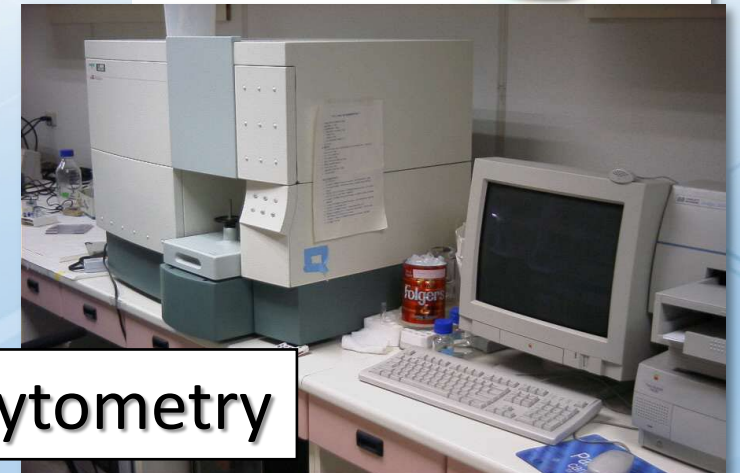
Pre-diabetes



Real-Time PCR



Flow cytometry



Join us in developing the next generation of Pharmacologists for Puerto Rico



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