



DEPARTMENT OF HEALTH & HUMAN SERVICES

## Memorandum

Date February 9, 2004  
From Principal Engineer, OEP, NIOSH  
Subject Final Progress Report for entry into NIOSHTIC2/NTIS for  
NIOSH Training Grant No. T01 CCT 210437  
To Vern P. Anderson, Chief, IRB, EID (C-18)

The enclosed report has been received from the Program Director to document work performed during the specified grant project period. The following information applies to the designated Training Project Grant (TPG):

Title: Graduate Training Program

Project Director: Jesus Gonzales, Ph.D.  
School of Public Health  
University of Puerto Rico  
San Juan, PR 00936

Grant No.: T01 CCT 210437

Project Period: 7/1/98 - 6/30/2003

Please place the report in DIDS and I also recommend it for entry into NIOSHTIC2 and submission to NTIS.

Thanks for your assistance.

A handwritten signature in black ink, reading "John Talty", is positioned above the typed name.

John T. Talty, P.E., DEE

Enclosure

fpr.pr

FINAL PERFORMANCE REPORT

NAME OF INSTITUTION:  
UNIVERSITY OF PUERTO RICO  
MEDICAL SCIENCES CAMPUS  
SCHOOL OF PUBLIC HEALTH  
SAN JUAN, PUERTO RICO 00936-5067

PROJECT TITLE:  
GRADUATE TRAINING PROGRAMS

DATE:  
SEPTEMBER, 2003

PROJECT DIRECTOR:  
JESUS GONZALEZ, PhD, CIH

CDC/NIOSH TRAINING GRANT NUMBER:  
T01/CCT210437

TOTAL PROJECT PERIOD:  
07-01-1998 TO 06-30-2003

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## Abstract

A five-year (July 1, 1998 to June 30, 2003) performance report for the University of Puerto Rico MS Industrial Hygiene Training Program was presented. The training Program was developed to contribute to occupational disease and injury prevention, particularly on the Island. Specific objectives of the Program are to train industrial hygienists for the growing need of this professional, to conduct research, and provide continuing education and outreach activities in this field. Major accomplishments during the period of the NIOSH training grant included complete the implementation of the new IH program, increase in faculty size and breadth, enhancement of the curriculum, more participation of program faculty in continuing education and outreach activities, and increase in research opportunities. During this time period 36 students completed their MS degree in Industrial Hygiene. One new faculty member was added in the area of ergonomics, adding to the Program a new field of expertise and an expanded opportunity for repetitive trauma and musculoskeletal injury and prevention.

## Significant Findings (Summary)

Major accomplishments of the program during the time covered in this reporting period include:

1. It was possible during this period to complete the implementation of the new academic Industrial Hygiene Program. The Program now grants a degree of Master of Science in Industrial Hygiene instead of the earlier degree of Master of Science in Environmental Health with Concentration in Occupational Health. Changes included substitution of courses, addition of new elective courses and substitution of sessions in existing courses.
2. A new faculty member with broad experience in ergonomics was recruited. Dr. Lida Orta-Anes worked for the UAW for several years. She was appointed in a recently created position by the University for the IH Program. This is a tenure track faculty position.
3. The Program was able to provide continuing education courses to practicing specialists and other citizens of the Island. This included courses in occupational medicine, occupational nursing, and in industrial hygiene and ergonomics.
4. All three full-time faculty members were involved in research projects. This also provided the Program with external funds, which contributed to the Program to achieve other important objectives.
5. Enrollment of students during the past five years was fairly steady compared with the two-year period of the previous report, but increased compared with the 1996 to 1998 period report submitted by the Program. A total of 50 full-time students enrolled during this period. This represents around 10 students per year.
6. Dr. Gonzalez renewed his ABIH certification during this reporting period.

## Body of report with conclusions

### Purpose and Program Characteristics

Due to the recent industrialization of the Island of Puerto Rico there is a great need of occupational health and safety professionals on the Island. Many pharmaceutical, electronic and refinery industry plants have established operations on the Island. Puerto Rico has one of the highest densities of pharmaceutical plants in the world. With an employed population of more than one million workers in more than 45,000 workplaces, the Island has experienced increases in occupational illness and injury for several years. According to worker's compensation data, on the average over the last ten years, six of every one hundred workers suffered an occupational injury or illness every year. This represents approximately 70,000 new cases every year. This high injury and illness incidence rate among the Puerto Rican workforce demonstrates the urgent need for training and research in occupational health and safety. The purpose of the Industrial Hygiene Program is to contribute to occupational injuries and illnesses prevention among the Puerto Rican people and other areas of the United States. The IH Program at University of Puerto Rico is the only industrial hygiene training program on the Island.

The training program is a graduate program and the trainees are granted the degree of Master of Science in Industrial Hygiene. The coursework includes: nineteen (19) credit-hours in public health,

ten (10) credit-hours in environmental health and twenty-nine (29) credit-hours in industrial hygiene courses. Ten additional credit-hours are available for elective courses. The current IH program core curriculum and faculty responsible is presented in the table below. The duration of the training program is two (2) years and is conducted by means of lectures, seminars, laboratory practices, field practices and research experiences.

Trainees are recruited at the predoctoral level with a bachelor degree in natural sciences (e.g., chemistry, biology, physics, general science or engineering). An admission index is used to select these candidates. The index is calculated based on the GPA, the GRE or equivalent (PAEG), work experience, and an interview as follow:

<u>Criterion</u>	<u>Weight</u>
GRE or PAEG score *	45%
Grade point average	25%
GPA in science and mathematics	5%
Work experience	10%
Interview	15%

\*The GRE and the PAEG scores are normalized to the same value.

According to the School's criteria, students are expected to have a minimum score of 55% in order to be admitted, however in the practical sense the minimum score for the Program, due to the number of applicants has ranged from 68% to 70% in recent years.

Table 1.

<i>Course</i>	<i>Num. of credits</i>	<i>Faculty Person Responsible</i>
Public health courses (19 credits)		
Core Course in Public Health	6	School Faculty
Statistical Analysis	5	G. Ramos, Ph.D.
Methods in Epidemiology	4	C. Perez, Ph.D.
Theory of Administration	4	R. Torres, Ph.D.
Environmental health courses (10credits)		
Principles of Environmental Health	3	Department Faculty
Environmental Toxicology	4	C. Rodriguez, Ph.D.
Environmental Health Law	3	J. Norat, Ph.D., J.D.



<i>Course</i>	<i>Num. of credits</i>	<i>Faculty Person Responsible</i>
Industrial hygiene courses (29 credits)		
Basic Principles of Occupational Health	3	C. Villafaña, M.D.
Industrial Hygiene	4	J. Gonzalez, Ph.D/G. Ortiz, M.S.
Industrial Hygiene laboratory	4	G. Ortiz, M.S. / J. Gonzalez, Ph.D.
Occupational Hazards Control	3	G. Ortiz, M.S.
Basic Principles Of Occupational Safety	4	C. Noble
Occupational Epidemiology	2	C. Nazario, Ph.D.
Field Practice in Industrial Hygiene	2	IH Faculty
Internship in Industrial Hygiene	6	IH Faculty
Seminar in Industrial Hygiene	1	J. Gonzalez, Ph.D.
<b>ELECTIVES (10 credits)</b>	10	IH/EH/School Faculty
<b>TOTAL</b>	<b>68</b>	

### Training Goals and Objectives

The goal of the Industrial Hygiene Program is to prepare industrial hygienists to supply the growing need of these professionals, particularly in Puerto Rico. Additional goals pursued by the program include: serve as a local resource for information dissemination; provide continuing education and outreach activities; to conduct applied and basic research in this field to contribute to the development of this discipline; and to develop a leadership role in this discipline on the Island.

Key objectives for the program for the last 5-year period focused on the following:

1. To complete the implementation of the new industrial hygiene MS Program. This included: (a) creation and offering of a new required course, (b) revision of some of the existing courses, and (c) the addition of new elective courses.

2. To recruit an additional industrial hygiene faculty member with ABIH certification.
3. For Professor Ortiz to achieve ABIH certification, and for Dr. Gonzalez to renew his.
4. To appoint a new and effectively utilize a program Advisory Board.
5. To recruit sufficient number of students of the highest quality and provide these trainees with adequate financial support.
6. To augment to a higher level the participation in continuing education activities.

### Program Accomplishment and Progress

*Curriculum.* Some changes were introduced to IH core courses during this reporting period in order to improve specific course areas. A four-hour presentation on indoor air quality was added to the Industrial Hygiene course (SAAM 6543). This presentation emphasizes on the recognition and evaluation of indoor air quality problems. A two-hour presentation on the control of these hazards was added to the Control of Occupational Health Hazards course (SAAM 6565). The Field Practice in Industrial Hygiene (SAAM 6566) course was created and is now offered on a regular basis. This course substituted SAAM 6525 that was used temporary to cover the field experience component of the training program. A new session devoted to the evaluation of ventilation systems was added to the Control course (SAAM 6565). The introduction during this period of an elective course in ergonomics, taught by Dr. Lida Orta-Anes, strengthened the elective offerings of the program. Dr. Orta-Anes's professional specialty of ergonomics will also add a new field of faculty expertise to the program. The high response by students to her course on ergonomics indicates their interest in this specialty as well. Almost all students in the past two years have taken this course. We anticipate that ergonomics will become an area of specialization within the current program, as more courses in this field will be added as electives.

The addition of the student's internship in industry has been a major asset of the Program. Students gained valuable hands-on experience and at the same time contributed to local industry goals of protecting health and safety of their employees. The program used to have a large number of requests for students for internships in industry. Also, during their internship students have the opportunity for interdisciplinary interaction with other health and safety professionals in industry.

*Trainees.* During the period covered by this report (July 1, 1998 to June 30, 2003), 50 students enrolled full-time in the IH program, or about 10 students per year. Thirty-six of them completed the Program requirements, an average of 7.2 per year, nine of them are still enrolled and five are pending to complete some requirements. The completion rate (student who entered the program and graduated) for this period was 86%. Three other students who entered the program in the previous period graduated in this period for a total of 39 graduates in this period. Their names and current employers, if known, are included in Appendix A. The substitution of the thesis requirement for an internship in the new curriculum has substantially improved the completion rate of these students. Of those completing the program, 30 were supported by NIOSH traineeships. Five others students supported by NIOSH are now in their second year and are expected to complete the program on May 2004. In the last five years, placement of graduates in professional positions, both in industry and government have been inspiring. Also the vast majority of these graduates are employed in Puerto Rico, helping meet the program's goal of training its graduates to meet the urgent need for these professionals on Island.



*Faculty growth and development* During this period a new faculty, Dr. Lida Orta-Anes, joined the faculty. Dr. Orta-Anes is a person with important national experience as Senior Ergonomist with the United Auto Workers Union. She has more than 12 years of experience in the field and serves or has served in policy setting committees in Washington D.C. and State MIOSHA regarding Ergonomics. She has also testified and coordinated the process for UAW witnesses participating in the Department of Labor 2000 public hearings for the Ergonomic Standard. Recently, the US Secretary of Labor Elaine L. Chao named Dr. Orta-Anes to the National Advisory Committee on Ergonomics. She is an active member of the National Safety Council ASC Z-365 Committee on Upper Extremity Cumulative Trauma Disorders and NIOSH National Occupational Research Agenda (NORA) Musculoskeletal Team. Also she has served as a reviewer in the first National Academy of Sciences (NAS) evaluation of the "State of the Science in Ergonomics." She is an active member of the American Public Health Association (APHA), Human Factors and Ergonomics Society (HFES) and the American Industrial Hygiene Association (AIHA). Dr. Orta-Anes contributes 50% of her time to teaching activities, currently teaching SAAM 6526 (Industrial Ergonomics), and the remaining 50% to research. She is currently conducting a study on the development of an anthropometric database describing the Latino workforce.

Dr. Jesus Gonzalez, director of Industrial Hygiene Academic Program and director of the NIOSH Training Project renewed his ABIH IH professional certification during this reporting period. He also was promoted to Chairperson of the Department of Environmental Health, the School of Public Health department that hosts the IH Program. During this period he has been the CoPrincipal Investigator of an epidemiological study and exposure assessment in power plants in Puerto Rico. Dr. Gonzalez served on the International Affairs Committee and Americas Sub Committee of the American Industrial Hygiene Association. He also served as president of the Puerto Rico Local Section of the American Industrial Hygiene Association. He was also an active member of the Alliance Against Asthma in Puerto Rico, a local community based project sponsored by the Allies Against Asthma National Program, and devoted to the development of a model health service program locally to improve the quality of life of children with asthma and their families. Dr. Gonzalez's participation in this project has been in the areas of research and education on identification, evaluation and mitigation of environmental asthma triggers in homes of children of low-income communities in Puerto Rico.

Professor Gerardo Ortiz, MS in Occupation Health, has more than 15 years of experience in the practice of industrial hygiene and occupational safety in industry and government. Although not presently ABIH certified, he is scheduled to take the certification examination in the spring of 2004. Professor Ortiz continued working in his doctoral dissertation and it is expected that he will complete his doctoral degree at the University of Texas in Houston during the next academic year.

Dr. Carlos Villafañá, a leader in occupational medicine on the Island, continued as an adjunct faculty to provide students with some interdisciplinary insights into clinical aspects of occupational health and safety. Outside lecturers continue to have an important role in teaching specific IH topics (e.g., occupational health, safety and IH issues). In addition, other faculty

members of the Department of Environmental Health and other Departments contribute to the Program by teaching and advising students. This faculty is listed in Table 1 above.

*Outreach.* The Industrial Hygiene Program played an important role in the training of practicing industrial hygienists, occupational physicians, occupational nurses and safety professionals and other professionals in Puerto Rico. Dr. Villafañá and Dr. Orta-Anes participated in several continuing education courses and field practices during this reporting period. A total of 8 courses were offered with the participation of 308 trainees. Topics included occupational medicine, occupational health nursing, ergonomics in manufacturing industry, occupational health hazards in agriculture, OSHA proposed standard on ergonomics and occupational chemical exposure limits. The IH faculty continued to provide outreach to community organizations, professional associations, governmental agencies and the general public of this region. Also Dr. Gonzalez participated in a training program for occupational health and safety professionals in Barranquilla, Colombia.

*Advisory Board.* A Program Advisory Board was appointed and met several times during this period. However, during the last two years the program had difficulties in convening an Advisory Board, mainly because other program vital actions needed to be taken. The Board had nine members representing labor, government, industry, students and professional organizations. The program will have to move speedily and convene an Advisory Board and use it effectively. The addition to the Program of a third tenure-track faculty member will guarantee the Board will be in place shortly, since tasks will be distributed more effectively.

### Conclusions

During this reporting period the Industrial Hygiene Program at the University of Puerto Rico has met important regional needs. Program faculty and students have contributed to the field of occupational health and safety through training, research, continuing education and outreach activities. The Program was successful in completing the implementation of the new degree-granting program, which offers a degree Master of Science in Industrial Hygiene. Other areas of achievement included the continuation of an excellent record for recruiting students and placement of graduates in the government and private sectors, and recruitment of a new full-time faculty member. The NIOSH training grant continues to make possible financial support to a significant number of trainees, and provided support to other program key activities.

### Publications

No publications resulted from this project.

## APPENDIX A.

List of trainees that have completed the training program during this reporting period.

<b>Trainee/Graduation date</b>	<b>Employer (as September, 2003)</b>	<b>Address</b>
<u>Year: 2002-2003</u>		
Luis Felipe Pieretti	Cordis / Johnson & Johnson	San German, P.R.
Jeasy Justiniano	Mova Pharmaceutica	Carolina, P.R.
Michelle Vendrell	Department of Health	San Juan, P.R.
Yara N. Sepúlveda Torres	Abbott Laboratory of P.R.	Barceloneta, P.R.
Limari Colón Vázquez	Wyeth –Ayerst Lederle, Inc.	Carolina, P.R.
Omayra Rodríguez Lozada	Abbott Laboratories	Barceloneta, P.R.
Michelle Cordovés	IPR-Pharmaceutical	Carolina, P.R.
María de los Angeles Ramos	University of Puerto Rico	Rio Piedras
<u>Year: 2001-2002</u>		
Judy Ann Urbina	McNeil Consumer & Specialty Pharmaceuticals	Las Piedras, P.R.
Nairy Santiago	Up-John Farmacia	Manatí, P.R.
Irelys Martí	Merck Sharp & Dhome	Manatí, P.R.
Jalixa Díaz	Glaxosmithkline	Cidra, P.R.
Migdalia García	Mova Pharmaceutical	Caguas, P.R.
Carmen Irizarry	Unknown	
Brenda Rodríguez	Faulding of Puerto Rico	Vega Baja, P.R.
Luis A. Rey	Medical Student	Bayamón, P.R.
	Central University	
Lorna Pérez Figueroa	Universidad de Puerto Rico	Rio Piedras. P.R.
<u>Year: 2000-2001</u>		
Lorraine Afanador	Merck Sharp & Dhome	Barceloneta, P.R.
Harry Cruz	US Army	Kentuky, US
Lalishka Ramírez	ICI Paint/Glidden	Carolina, P.R.
Vanessa Rodríguez	Medical Sci. Campus/UPR	San Juan, P.R.
Carmen Román	IPR	Canóvanas, P.R.
Angel Martínez	Unknown	
Janice López	Pfizer	Arecibo, P.R.
Olga Alsina	LRN Environmental	Guaynabo, P.R.
Elaine Santiago Sindo	Arecibo Campus/UPR	Arecibo, P.R.
Zulma González Borrero	Arecibo Campus/ UPR	Arecibo, P.R.
María Georgina Pérez	ATSDR	Atlanta, Georgia US
<u>Year: 1999-2000</u>		
María I. Rivera Cabán	Pfizer	Vega Baja, P.R.

Brenda I. Pérez Colón  
Adrienne De Jesús Delgado  
Wilma López Carrera  
Tonia Simmonds Shortride

Private Consultant  
ATSDR  
Private Consultant

Rio Piedras, P.R.  
Atlanta, Georgia US  
San Juan, P.R.

Year: 1998-1999

Angélica Torres  
Ana I. Contreras  
Gisela Dávila  
Edna Maldonado

Private Consultant  
Unknown  
Abbott Laboratories  
McNeil Consumer &  
Specialty Pharmaceuticals.  
Unknown  
Johnson & Johnson

Humacao, P.R.  
  
Barceloneta, P.R.  
Las Piedras, P.R.  
  
Juncos, P.R.

Yohana Hudo  
Ana María González