

FINAL PERFORMANCE REPORT

**University of Colorado
Health Sciences Center
Denver, Colorado 80262**



PB98-130750

Project Title: Occupational and Environmental Medicine Residency Training Grant

Total Project Period: July 1, 1993 - June 30, 1996

Project Director: A. James Ruttenger, MD, PhD

NIOSH Grant Number: T01/CCT810468

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ABSTRACT

With support from NIOSH, the University of Colorado Occupational and Environmental Medicine Residency Program expanded and developed during the grant period. Physicians completing the program are board eligible in Occupational/Environmental Medicine and are prepared for careers in occupational and environmental medicine. This program contributes to the supply of highly skilled physicians in this field both regionally and nationally. With the NIOSH training grant, we have supported portions of tuition or stipends of five physician trainees in our occupational medicine residency. In addition, the entire curriculum of this residency program evolved during the last four years with the start of the residency. During the training grant period, we have modified the problem-based learning course from a three quarter course to a year-round course, incorporating the content of the orientation period during the first seven weeks of the first year.



SIGNIFICANT FINDINGS

In the last year, two residents received partial support from the grant: both of whom were in their academic year. They will obtain MSPH degrees after completing their thesis requirements. One of them will continue to have NIOSH support in the 1996-7 year. Another, a former NIOSH trainee, completed his residency program on June 30, 1996; he has taken a hospital position in occupational medicine in Portland, Oregon.

Of the other four residents who have completed our training program, two now work in academia (National Jewish Center's Occupational and Environmental Medicine Division and Duke University); one is in corporate medicine with the Exxon Chemical Company and one has joined a hospital-based multi-client occupational medicine service. Our current three residents have yet to define their career plans, with the exception of one pulmonary fellow resident who plans a career in research on occupational lung diseases.

In addition to training residents, we have trained physicians, graduate students, postdoctoral fellows, and medical students in occupational and environmental medicine. In the last five years we have stimulated interest in occupational medicine in five preventive medicine residents--one is now working for the National Institute for Occupational Safety and Health, one for the Employee Health Service Clinic at University Hospital, two who completed practicums, and one who spent an additional fellowship year working on an epidemiologic study of workers at Rocky Flats. We also provided training for a physician and a veterinarian who joined the Epidemiology Intelligence Service at the Centers for Disease Control in non-occupational medicine positions; in a preventive medicine resident now working in environmental health for a state health department; and in a physician who is completing a joint fellowship in occupational medicine and pulmonary medicine at the University of Washington in Seattle.

We have supported the thesis research of eight non-physician masters level students, and have brought two postdoctoral fellows into occupational lung disease research careers. Ten internal medicine residents have rotated through our occupational medicine service for a month or longer since 1991, two of whom have entered occupational medicine training. The high number of our trainees and students in the last five years who have entered the occupational medicine or public health field apart from or in the absence of a residency program attests to the regional interest in occupational medicine training and to the success of our faculty in stimulating and nurturing an abiding enthusiasm for the field.



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Background

Physicians seeking training and officers of the Rocky Mountain Academy of Occupational Medicine pressured the University of Colorado School of Medicine (a school within the University of Colorado Health Sciences Center) for several years to implement residency training in occupational medicine. However, the only faculty members in occupational medicine were located in the Occupational and Environmental Medicine Division at National Jewish Center for Immunology and Respiratory Medicine, a major teaching hospital for the School of Medicine. In 1988, Kathleen Kreiss, M.D., director of the Occupational and Environmental Medicine Division at National Jewish, and William Marine, M.D., M.P.H., director of the Preventive Medicine Residency at the School of Medicine, were awarded an Academic Enrichment Award by the School's chancellor to evaluate the feasibility of a residency training program in occupational medicine.

With the 1991 addition of A. James Ruttenber, M.D., Ph.D., an associate professor in the School's Department of Preventive Medicine and Biometrics, the two institutions jointly committed to an Occupational and Environmental Medicine Residency which admitted its first three residents in 1992. The residency is directed by Kathleen Kreiss, M.D., with Dr. Ruttenber serving as Associate Residency Director. The Residency is fully accredited by the Accreditation Council on Graduate Medical Education.

By establishing the residency training program, the opportunities for clinical and research training in occupational medicine and related fields expanded quickly, both at National Jewish and the Department of Medicine and Biometrics. The faculty with clinical expertise expanded from four to seven occupational physicians, with the addition of experts in toxicology and industrial hygiene. The number of hours of classroom training in occupational health, toxicology, and industrial hygiene also expanded. The Department of Preventive Medicine and Biometrics established a doctoral program in epidemiology, and occupational epidemiology is one of the areas of concentration in this program.

The number of faculty research projects in occupationally-related problems more than doubled over the award period, providing expanded opportunities for graduate student training. The Occupational and Environmental Medicine residents play an important role in educating fellow graduate students and residents through informal discussions and projects in the classes they take. Small class size and an emphasis on problem solving by small groups facilitate such dialog.

Institutional Commitment

In addition to the Occupational and Environmental Medicine Residency, both the Health Sciences Center and National Jewish contributed substantially to training in occupational and environmental medicine for students with a variety of backgrounds.

The Department of Preventive Medicine and Biometrics supported an accredited master of science in public health (MSPH) degree program, a general preventive medicine residency, a doctoral program in analytic health sciences with concentration areas in both biometrics and epidemiology, and research programs in injury and radiation epidemiology.

The University of Colorado Health Sciences Center supported a clinical toxicologist who is board certified in occupational and environmental medicine, employee health expertise through its Employee Health Service, and a molecular toxicology research and training program (which emphasizes environmental toxicology) at the School of Pharmacy.

The National Jewish Center supported five faculty in occupational medicine who have full (not merely clinical) appointments at the School of Medicine, a mature and funded research program, a busy consultation service and clinic, and industrial hygiene collaboration in research, service, and training. The major commitment of faculty and residency coordinator time for the startup of the new residency was supported by an Environmental and Occupational Medicine Academic Award from the National Institute of Environmental Health Sciences to Dr. Kreiss. This award allowed her to commit 50% of her time over five years (ending in June 1996) for developing and implementing new curriculum, achieving provisional and full accreditation, and securing resident and stipend monies.

Institutional commitment to residency training was consolidated by seed money for residency training provided by the Texaco Philanthropic Foundation. The Foundation awarded Dr. Kreiss \$310,000 over the 1990-95 period for the initiation of residency training in a joint endeavor between National Jewish and the School of Medicine. These monies enabled us to obtain approval from the Dean of Graduate Medical Education for two entering residents/fellows per year, and were used to leverage additional training monies from industrial practicum sites, grants and contracts, the Department of Preventive Medicine and Biometrics, National Jewish Center, the Agency for Toxic Substances and Disease Registry, the Occupational Physician Scholarship fund, the Rocky Mountain Academy for Occupational and Environmental Medicine, and the National Institute for Occupational Safety and Health (NIOSH).

Need

The national dearth of physicians trained in occupational and environmental medicine was recognized by the Institute of Medicine (Role of the Primary Care Physician in Occupational and Environmental Medicine. Washington, D.C.: National Academy Press, 1988; Rosenstock et al., New England Journal of Medicine, 325:924-927, 1991), and was reflected in Colorado and other states in the Rocky Mountain Region. Colorado has 33 board-certified occupational medicine physicians in active practice, six of whom are nearing retirement and only nine of whom have had occupational medicine residency training. New Mexico has 11 board-certified practicing physicians, Nebraska has 4, Montana 2, and Wyoming has none. To the west, Arizona has 25 and Utah has 3, despite residency training programs in these two states. Clearly, a regional need existed for more trained occupational medicine specialists, as reflected in these low numbers. This need was also reflected in the difficulty experienced by major Colorado corporations in staffing their medical departments with physicians knowledgeable in occupational medicine: only five of the board-certified Colorado physicians are employed in such corporate settings. Our residency graduates have had many choices of desirable jobs, in industry, private health sector, and academic settings.

Given the public and governmental interests in exposures to toxic agents in the workplace, state, county, and local health departments needed professionals trained in occupational and environmental health. In the Rocky Mountain Region, graduate-level training in occupational and environmental health was provided in only two programs in Colorado, in one program in Montana, one in Utah, and one in Arizona. Our program in occupational and environmental health provided advanced training for a number of MSPH graduates and Preventive Medicine residents who have taken jobs in health departments in Colorado and other western states.

Contribution

We have the capability to train two entering residents/fellows per year in occupational medicine. We make a special contribution in the quality of our training in two ways. First, we have a well-rounded program with depths in complex diagnostic clinical occupational medicine, epidemiologic and laboratory research, and practical problem solving in industrial and labor practicums. Secondly, we have premier occupational lung disease research and clinical opportunities; this strength has attracted pulmonary physicians for joint training in occupational medicine in preparation for academic careers.

Program Leadership and Faculty

Dr. Kathleen Kreiss is the Residency Director, and Dr. James Ruttenber, is Associate Residency Director. They are assisted by the four National Jewish faculty and by Dr. John Martyny, an industrial hygienist with the Tri-County Department of Health, as listed in Table 1. Other core faculty from the School of Medicine include Drs. Marine (in the Department of Preventive Medicine and Biometrics) and Kosnett and Mueller in the Division of Emergency Medicine of the Department of Surgery. Additional affiliated and volunteer clinical faculty have expertise in important areas of occupational and environmental health (Table 2); they are available for teaching, to supervise projects, and for consultation.

This faculty has differentiated roles, with academic year course work and curriculum development being directed by Drs. Marine and Ruttenber, although all faculty participate in both the introductory course in occupational and environmental health directed by Dr. Marine and the year-round problem-based learning course in advanced occupational and environmental health. Clinical supervision is provided by Drs. Rose, Newman, Fennelly, and Balkissoon at National Jewish, and by Drs. Mueller and Kosnett at the Employee Health and Toxicology Clinics at the University of Colorado Health Sciences Center. All faculty supervise graduate student and resident projects, whether theses or other efforts related to clinical cases, industrial consultation, labor consultation, and practicum sites. Drs. Kreiss and Ruttenber supervise curriculum and practicum choices; evaluations of curriculum, faculty, and trainees; the admissions process; the accreditation process; and the residency and stipend budgets.

Table 1. Core Faculty for Training in Occupational and Environmental Health

Faculty Member	Area of Competence	Role	Per Cent Time
Kathleen Kreiss, M.D.	Occupational lung disease, epidemiology, indoor air pollution, construction work health effects	Residency Director; course work, clinical and project supervision, thesis committees	25%
James Rutenber, M.D., Ph.D.	Occupational and environmental epidemiology, exposure and risk assessment, radiation and drug abuse epidemiology	Associate Residency Director; academic advisor, course work, project and thesis supervision	25%
John Martyny, Ph.D., C.I.H.	Industrial hygiene	Industrial hygiene training and consultations, course work	10%
Cecile Rose, M.D.	Bioaerosols and hypersensitivity pneumonitis	Clinical and project supervision	10%
Ronald Balkissoon, M.D.	Occupational lung disease	Clinical and project supervision	5%
Kevin Fennelly, M.D., M.P.H.	Health effects of air pollution; occupational risks for health-care workers	Clinical and project supervision	5%
Michael Kosnett, M.D., M.P.H.	Clinical toxicology	Toxicology consultation, course work	5%
William Marine, M.D., M.P.H.	Epidemiology of occupational injuries	Course work, project supervision	5%
Kathryn Mueller, M.D., M.P.H.	Managing employee health clinics; medical problems of health-care workers	Clinical and project supervision	5%
Lee Newman, M.D.	Beryllium disease, occupational lung disease	Clinical and project supervision	5%

**Table 2. Affiliated and Volunteer Clinical Faculty for Training in Occupational
And Environmental Health**

Affiliated Faculty Member	Area of Competence
Willard Chappell, Ph.D.	Environmental health, health effects of heavy metals
James McKinley, M.D.	Occupational medicine, Denver General Employee Health
John Reif, D.V.M., M.Sc.	Environmental epidemiology, Colorado State University
Lorann Stallones, Ph.D.	Environmental epidemiology, Colorado State University
James Todd, M.D.	Infectious disease epidemiology
Michael Wilson, Ph.D.	Environmental toxicology, health risk assessment, environmental health education
Volunteer Clinical Faculty	Area of Competence
Marcus Bond, M.D.	Occupational and environmental health consulting
Yvonne Boudreau, M.D., M.S.P.H.	Occupational and preventive medicine, tuberculosis, NIOSH Region VIII
Edwin Healy, M.D.	Corporate occupational medicine, Lockheed Martin
Joseph Furman, M.D., Sc.D.	Occupational medicine, Rocky Flats
Alan Hall, M.D.	Medical toxicology
Myron Harrison, M.D., M.P.H.	Corporate occupational medicine, Exxon Corporation
Ellen J. Mangione, M.D., M.P.H.	Environmental health, Colorado Department of Public Health and Environment
Richard L. Masters, M.D., M.P.H.	Aerospace medicine
John Morrison, M.D.	Corporate occupational medicine, Gates Rubber Company
Henry Roth, M.D.	Corporate occupational medicine, Gates Rubber Company
Quay Snyder, M.D.	Union occupational medicine, Air Line Pilots Association
Daniel T. Teitelbaum, M.D.	Occupational toxicology
Theodora A. Tsongas, Ph.D.	Occupational and environmental health
Nancy Wertheimer, Ph.D.	Environmental health

Program Objectives

Our program objectives for occupational and environmental medicine residents are based on competencies and performance indicators prepared by the American College of Preventive Medicine. We apply similar criteria to graduate students who concentrate their efforts in occupational and environmental health. The goal of our training program is for residents and graduate students to have achieved the following at the conclusion of their training:

1. A solid understanding of the basic disciplines of public health and preventive medicine: biostatistics, epidemiology, health service organization and administration, and social and behavioral sciences in community health. This understanding is provided by the course work for the MSPH degree, which is fully accredited by the Council on Education for Public Health.
2. Familiarity with the disciplines upon which occupational medicine relies: toxicology, industrial hygiene, and occupational and environmental epidemiology. Basic academic training in these areas is given in the core occupational and environmental health course in the MSPH program and in the year-long problem-based learning course in advanced occupational and environmental medicine. Applied training occurs in the practicum rotations, toxicology clinic, National Jewish Clinical Case conference (attended by Dr. Martyny and a member of his industrial hygiene staff), and thesis projects.
3. A thorough knowledge of clinical occupational/environmental medicine, including the ability to take an accurate and comprehensive occupational/environmental history; to assess workplace and industrial process information; to synthesize clinical data and reviews of the scientific literature in patient evaluation; to accurately diagnose and treat occupational/environmental disorders; to evaluate impairment; to educate patients and their employers regarding the nature of work-related illness and appropriate prevention, including personal protective equipment, ventilation, and other engineering controls; to use preventive medicine techniques, such as questionnaire design, medical surveillance principles, and reporting; to make appropriate referrals for social work assistance, legal counseling, and vocational rehabilitation; and to select suitable treatment or referral for employees with substance abuse problems. This clinical training occurs under supervision of core faculty for the residency at the National Jewish Occupational/Environmental Medicine Clinic and at the University of Colorado Health Sciences Center Employee Health Service, Emergency Department, and associated clinics (Toxicology, Rehabilitation, Physical Therapy, Hand Surgery, and Orthopedics). Practical application of these clinical skills occurs in industrial practicum rotations which have clinical components.
4. The ability to analyze, synthesize, interpret, and present health data for professional and lay audiences. This skill is learned through completion of a thesis or a publishable paper required for the MSPH degree, presentations at the weekly clinical case conference at National Jewish, participation in journal club, team-based learning in the problem-based learning course, and experience in health education at practicum rotations.

5. An understanding of how knowledge in the field of occupational and environmental medicine is advanced. This is accomplished in the advanced occupational and environmental medicine course and through the design and execution of a research project (usually the thesis project), carried out under core faculty supervision. The project may be within the research program of a core faculty member or arise out of work at a practicum site.
6. An understanding of the institutional structures affecting occupational disease and injury and their prevention, including workers' compensation, third party liability, corporate, labor, and government entities. This understanding comes out of many experiences, including visits to government agencies, the problem-based learning course, and clinical, industrial, and government practicums.
7. The ability to function in a multidisciplinary team acting to assess workplace and environmental hazards and their remediation. This experience is provided by accompanying the industrial hygiene and epidemiology consultation teams at National Jewish in service work, clinical follow back by the Occupational and Environmental Medicine Clinic to workplaces, in the problem-based learning course; participating on multidisciplinary teams in thesis projects; and working with multidisciplinary teams at industrial and government practicum sites, which often include occupational health nurses and safety professionals.
8. An understanding of the organization and administration of programs to protect worker health, including the collection, management, and analysis of health data. This knowledge is gained during course work, thesis projects, and rotations at industrial and government practicums.

Sequence of Academic and Practicum Training for Residents

In the initial summer quarter of the academic year, residents obtain a general practical introduction to the field through the first quarter of the Problem-Based Learning course and clinical epidemiology course. During this time, they are introduced to occupational and environmental history taking; review a toxicology text; become familiar with labor and management perspectives by reporting on historical literature pertinent to the field; visit OSHA, NIOSH, and state and local health departments; and develop/improve their computer literacy with attention to software pertinent to occupational health including database search strategies and internet access. They also attend introductory didactic sessions with general preventive medicine residents in the department. At National Jewish, they attend sessions on pulmonary function testing, the International Labor Organization classification system of chest radiographs for pneumoconioses, an introduction to occupational dermatology, and workers' compensation.

The academic year for the core MSPH courses begins in late August and has three quarters. Fall quarter required courses are: Health Care Systems I, Biostatistical Methods I, and Epidemiology. Winter quarter courses are: Health Care Systems II, Biostatistical Methods II, and Occupational and Environmental Health. Spring quarter courses are: Research Methods in Community Health, Social and Community Factors in Health, and Community Health Practice (See Appendix F for course descriptions). In addition to the core MSPH courses, occupational and environmental medicine residents take the problem-based learning course in Advanced Occupational and Environmental Medicine each quarter to supplement their learning of industrial hygiene, occupational and environmental epidemiology, and toxicology. As the

year progresses, our residents are expected to take increasing responsibility for leadership in the problem-based learning course.

By the end of the spring quarter, residents pick a provisional thesis topic or project anticipated to result in a publishable paper, to be pursued after formal course work is complete. The project may be within the research program of core residency faculty or in conjunction with second-year practicum site efforts. The month after courses end is usually devoted to outlining the thesis proposal, in consultation with the residency director or associate director. A core faculty member is the chairperson of the thesis committee which endorses the written thesis proposal, thesis, and thesis defense.

Practicum training begins in the academic year in order to provide motivation for academic education. Throughout the first year, each resident spends one day per week at the same industrial practicum site. In addition to the industrial practicum in the first year, the residents spend a half-day per week in a clinical practicum in the Occupational and Environmental Medicine Clinic at National Jewish or at the Employee Health Service and associated referral clinics at the University of Colorado Health Sciences Center. At National Jewish, they see patients with suspected occupational or environmental lung diseases, participate with the clinical faculty and other members of a multidisciplinary team in investigations, learn the complex socio-industrial context in which prevention efforts take place, and have an opportunity to observe the legal implications of diagnoses of occupational disease.

At the Employee Health Service, residents see more routine occupational conditions, with an emphasis on musculoskeletal complaints. They manage cases with the assistance of nurse case managers; attend specialty clinics required by their patients (such as orthopedics, neurology, and hand clinics); rotate through the emergency room if they need further trauma experience; familiarize themselves with workers' compensation procedures, interface with supervisors, employee assistance specialists, and industrial hygienists; review or prepare practice guidelines; and attend toxicology referral clinic.

Whether their clinical rotation is at the University's Employee Health Clinic, at National Jewish, or at a second-year practicum site, they attend the weekly clinical case conference at National Jewish to present cases or review clinical topics; hear the comments of the industrial hygienist, occupational health nurse, psychologist, and toxicologist; and to confer with occupational medicine clinical faculty. In addition, residents attend these periodic sessions: Preventive Medicine Grand Rounds, monthly journal club, and monthly occupational medicine research in progress seminars.

The second year is devoted to required practicums, research, and elective rotations. Clinical practicums continue at National Jewish, Employee Health Service, or elective clinical facilities on the day of the National Jewish Clinical Case Conference. The non-clinical practicum rotations include a mandatory month in a government agency involved in the practice of occupational and environmental health efforts (Colorado Department of Health, Colorado Department of Labor's Workers' Compensation Division, or a local or national NIOSH office) and at least four months in industrial practicums. Core industrial practicums include the Rocky Flats Environmental Technology Site, Lockheed Martin, and the Employee Health Clinic at University Hospital. In addition to clinical practice at these industrial practicums, residents have unique nonclinical opportunities.

In addition to the core industrial practicums, we have arranged unique practicums in conjunction with new faculty projects, such as a study of respiratory illness among workers during the construction of Denver International Airport, surveillance for beryllium sensitivity and disease at Brush Wellman, Inc. (a beryllium industry), and with special interests of residents, such as a practicum in corporate medical administration at Dow Corning.

Residents are also required elect a short-term labor practicum at the Air Line Pilots Association.

Residents devote two to six months of the second year to completion of their thesis or publishable research paper. The literature review, data analysis, and writing are done under the supervision of core faculty at either National Jewish or the School of Medicine. The resident uses the facilities at either or both locations, and may spend additional time at a practicum site if appropriate. The balance of the second year consists of elective rotations tailored to the professional goals of the resident. Those residents interested in faculty positions are strongly encouraged to pursue research electives, usually into a third or fourth fellowship year.

Expectations and Evaluation

We expect residents to function competently and comfortably in their occupational and environmental health positions upon completion of their training. To this end, we require them to assume responsibility for clinical practice and follow-through, for written reports of thesis and practicum projects, and for teaching of other residents through didactic seminars, research and case presentations, and journal club. Since knowledge in occupational and environmental medicine requires on-going synthesis of information from a variety of sources, we expect residents to develop and demonstrate critical reading skills through clinical case discussions, the thesis project and by making presentations in journal club. For each practicum rotation, the resident identifies pertinent American College of Preventive Medicine competency-based learning objectives and reviews these with the faculty preceptor at the rotation's end.

Residents do not usually have direct responsibility for making depositions in legal cases involving their patients. There are, however, ample opportunities for residents to understand the setting and skills necessary to handle themselves professionally in this context.

The residency director has had assistance in evaluating each segment of the residency curriculum from Carol Vojir, Ph.D., an evaluation specialist in the Office of Academic Affairs at the University of Colorado Health Sciences Center. The five years of her consultation, supported by Dr. Kreiss's Academic Award, has resulted in routine procedures for evaluating curriculum, trainees, and faculty—procedures which are periodically reviewed by the Residency Advisory Committee. In addition, the Educational Services Group at the School of Medicine routinely conducts student evaluations of courses and teaching with standardized forms for classroom teaching, small group courses, and clinical rotations. To evaluate the effectiveness of our training over the long-term, we maintain contact with graduates and track their careers.

Training Candidates

We preferred candidates with full clinical training in internal or family medicine and gave special consideration to pulmonary fellows who sought joint training in preparation for academic careers. Our admissions committee was composed of core National Jewish and Preventive Medicine faculty and the M.S.P.H. director. The committee reviewed applications, recommendation letters, and impressions from personal interviews with candidates in order to select the strongest candidates whose career goals would be best furthered by the offerings of the residency. The application materials considered include all academic transcripts, medical school class rank, MCAT scores, and an essay. We sought to match our training strengths with the backgrounds and aspirations of candidates. To this end, we looked for strong academic records in previous training, diligent care of patients, evidence of cooperation in multidisciplinary team-oriented work environments, and a commitment to prevention and public health. We were particularly interested in candidates enthusiastic about the thesis requirement and about advancing our knowledge of occupational health and its implementation.

We recruited candidates by word of mouth; by soliciting applications from primary care residents, pulmonary, and allergy fellows who have rotated through the National Jewish clinic; and by advertising in journals. Joint training in pulmonary medicine and occupational medicine started in July 1995. The advantage of such a joint program with pulmonary medicine is that the stipend cost per resident is 50% lower because of the shared responsibility for training costs.

To date, our recruitment strategy has resulted in a sufficient number of superb applicants and residents. The four residents who have completed our residency include three internists and a pulmonologist. Our current residents include an internist/gastroenterologist and two pulmonary fellows at the University of Colorado. In addition to our supported residents, we assisted in training MSPH physician candidates who are already working in the occupational medicine field and who may apply for practicum years when their academic course work is complete; at present, two such MSPH candidates are in the Department of Preventive Medicine and Biometrics. Three additional MSPH or Preventive Medicine Residency graduates are now working in occupational medicine. In addition, we recruited two internal medicine residents into the field, although they sought training outside of Colorado. Over the past three years, there were 20 applicants for the residency program; eight were accepted, and eight entered training (one of the eight was a part-time trainee who subsequently withdrew).

Training Facilities and Resources

Institutional resources from both the School of Medicine and National Jewish existed for the training program in the award period. The commitment from the School was demonstrated by Dr. Ruttenber's recruitment, Dr. Kreiss' July 1, 1996 transfer to the school, the reservation of two MSPH slots for our residents, allocation of a portion of the MSPH coordinator's efforts, and a budget for advertising, brochure printing, residency director travel, accreditation expenses, and miscellaneous expenses (\$3,925 annually). The National Jewish resources consist of partial support of research/training time for its faculty.

In the past, National Jewish has supported stipends and training costs of residents in special circumstances, such as when Dr. Fennelly was finishing his training with a commitment of a faculty position and in allowing service revenue generated by a resident in a thesis project to be returned to residency stipends. Additional one-time stipend resources for training have consisted of an Agency for Toxic Substances and Disease Registry fellowship for one year to Dr. Fennelly, Occupational Physicians Scholarship Fund fellowship support for two years to Dr. Harris and one year to Dr. Maier, \$28,000 over three years from the Rocky Mountain Academy of Occupational Medicine, and modest monies from industrial practicum sites for resident-provided service (about \$1000/week).

Other Sources of Training Money

Dr. Kreiss, residency director, was supported by an NIEHS Academic Award for her time in residency administration and teaching (\$50,000). James Harris, resident, was supported by an Occupational Physician Scholarship Fund stipend (\$29,500). The Department of Preventive Medicine and Biometrics contributed \$3,897.20 toward residency training. Research accounts at National Jewish Center for Immunology and Respiratory Medicine supported the remainder of the expenses of the three residents (\$105,256.33). The residency received \$8,000 from the Rocky Mountain Academy of Occupational and Environmental Medicine and \$8,912.50 from Rocky Flats for resident services, which will be used in the coming year.

Training Record

Of the four residents who have completed our training program (Appendix C), two now work in academia (National Jewish Center's Occupational and Environmental Medicine Division and Duke University); one is in corporate medicine with the Exxon Chemical Company, and one has joined a hospital-based multi-client occupational medicine service. Our current three residents have yet to define their career plans, with the exception of one pulmonary fellow resident who plans a career in research on occupational lung diseases.

In addition to training residents, we have trained physicians, graduate students, postdoctoral fellows, and medical students in occupational and environmental medicine. In the last five years we have stimulated interest in occupational medicine in five preventive medicine residents—one is now working for the National Institute for Occupational Safety and Health, one for the Employee Health Service Clinic at University Hospital, two who completed practicums, and one who spent an additional fellowship year working on an epidemiologic study of workers at Rocky Flats. We also provided training for a physician and a veterinarian who joined the Epidemiology Intelligence Service at the Centers for Disease Control in non-occupational medicine positions; in a preventive medicine resident now working in environmental health for a state health department; and in a physician who is completing a joint fellowship in occupational medicine and pulmonary medicine at the University of Washington in Seattle.

We have supported the thesis research of eight non-physician masters level students, and have brought two postdoctoral fellows into occupational lung disease research careers. Ten internal medicine residents have rotated through our occupational medicine service for a month or longer since 1991, two of whom have entered occupational medicine training. The high number of our trainees and students in the last five years who have entered the occupational medicine or public health field apart from or in the absence of a residency program attests to the regional interest in occupational medicine training and to the success of our faculty in stimulating and nurturing an abiding enthusiasm for the field.

Progress Report

With the current NIOSH training grant (July 1993- June 1996), we have supported portions of tuition or stipends of five physician trainees in our occupational medicine residency (Table 4).

The entire curriculum of this residency program evolved during the last four years with the start of the residency. During the training grant period, we have modified the problem-based learning course from a three quarter course to a year-round course, incorporating the content of the orientation period during the first seven weeks of the first year. The curriculum changes were not supported by the training grant because all monies were spent on tuition, fees, and resident stipends. No inventions have been conceived or reduced to practice during the period of the existing training grant.

Training Objectives and Goals

We accomplished the training objectives and goals of the Occupational and Environmental Medicine Residency at the University of Colorado School of Medicine described in our initial application for this grant. All of the NIOSH training monies were spent on resident stipends, tuition, and fees.

List of Results

In the last year, two residents received partial support from the grant: Lisa Maier and John Perkner both of whom were in their academic year. They will obtain MSPH degrees after completing their thesis requirements. John Perkner will continue to have NIOSH support in the 1996-7 year. James Harris, a former NIOSH trainee, completed their residency program on June 30, 1996; he has taken a hospital position in occupational medicine in Portland, Oregon.

List of Publications

Epling CA, Rose CS, Martyny JW, Zhen B, Alexander W, Waldron JA, Kreiss K. Endemic work-related febrile respiratory illness among construction workers. *Am J Indust Med* 1995;28:193-205.

Harris J, Bucher-Bartelson B, Barker E, Balkissoon R, Kreiss K, Newman LS. Serum neopterin in chronic beryllium disease. Submission pending.

Table 3. Residency Trainees

Resident	Prior Training	Training Status
Kevin Fennelly, M.D., M.P.H.	Pulmonologist	Completed, 1993
Carol Epling, M.D.	Internist	Completed, 1994
Douglas Patron, M.D.	Internist	Completed, 1994
James Harris, M.D.	Internist	Completed, 1996
P. K. Vedanthan, M.D.	Allergist	Withdrew, 1994
John Perkner, M.D.	Gastroenterologist	First year, 1995-6
Brigitte Gottschall, M.D.	Pulmonary Fellow	First year, 1996-7
Lisa Maier, M.D.	Pulmonary Fellow	First year, 1995-6

Table 4. Residency Graduates, 1993-6

Name	Graduation Date	Present Position	Year ABPM Certified
Kevin Fennelly, M.D., M.P.H.	6/93	Occupational Physician Assistant Professor National Jewish Center	1995
Carol Epling, M.D.	6/94	Occupational Physician Assistant Professor Duke University School of Medicine	1996
Douglas Patron, M.D.	6/95	Occupational Physician Exxon Chemical Corporation	1996
James Harris, M.D.	6/96	Occupational Physician Director, Occupational Medicine	1996



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		11. Contract (C) or Grant(G) No. (C) (G) T01-CCT-810468	
12. Sponsoring Organization Name and Address Department of Preventive Medicine and Biometrics, Health Sciences Center, University of Colorado, Denver, Colorado		13. Type of Report & Period Covered	
		14.	
15. Supplementary Notes			
16. Abstract (Limit: 200 words) This report described advancements made in the residency program for occupational and environmental medicine training at the University of Colorado during the grant period. With this grant the program has supported portions of tuition or stipends of five physician trainees in their residency. The entire curriculum of this program evolved during the last 4 years with the start of the residency. Modifications were made to the problem based learning course from a three quarter course to a year round course, incorporating the content of the orientation period during the first 7 weeks of the first year. In addition to training residents the program has trained physicians, graduate students, postdoctoral fellows, and medical students in occupational and environmental medicine. Interest has been stimulated in occupational medicine in five preventive medicine residents. Support has also been given to the thesis research of eight nonphysician masters levels students, and two postdoctoral fellows were brought into the occupational lung disease research career. Ten internal medicine residents have rotated through the occupational medicine service for a month or longer since 1991, with two entering the occupational medicine training program.			
17. Document Analysis a. Descriptors			
b. Identifiers/Open-Ended Terms			
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c. COSATI Field/Group			
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