Meeting of theTask Force on
Medical Rehabilitation Research

June 28–29, 1990

TIRR FOUNDATION

Lex Frieden

MEETING OF THE TASK FORCE ON

MEDICAL REHABILITATION RESEARCH

June 28-29, 1990

o Basic and Clinical Research Training

Hunt Valley Inn
Hunt Valley, Maryland

BACKGROUND MATERIAL FOR THE MEETING OF THE
TASK FORCE ON MEDICAL REHABILITATION RESEARCH

June 28-29, 1990

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JUNE 28-29, 1990

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TASK FORCE ON MEDICAL REHABILITATION RESEARCH June 14, 1990

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TASK FORCE ON MEDICAL REHABILITATION RESEARCH

June 28-29, 1990

OUTLINE OF REPORT

I. EXECUTIVE SUMMARY

II. BACKGROUND--Overview of the Unique Nature of Medical Rehabilitation Research and its Emergence as a Significant Area of Biomedical Research.

III. SCIENCE PANELS

- Neurophysiological Dysfunction (In reporting on each scientific area, the individual panels will provide the following subsets of information.)
  - Historical Overview--briefly describe the prevalence, incidence and economic costs of relevant disabilities or diseases that involve medical rehabilitation research.
  - Recent Accomplishments and the Current State of Scientific Research--status of ongoing research and expectations for contributing to the knowledge base relevant to medical rehabilitation research.
  - Scientific Research Opportunities, Strategies, and Priorities--identify new and emerging research opportunities that are relevant to medical rehabilitation research; formulate priorities on the basis of those research opportunities.
  - Summary of Research Recommendations--recommendations for enhancing the scientific environment in medical rehabilitation research.
    - Major Scientific Research Opportunities
    - Major Clinical Research Opportunities
- Musculoskeletal Disorders
- Cancer Rehabilitation
- Geriatrics
- Developmental Issues in Rehabilitation

IV. CROSS-CUTTING ISSUES

- **Basic and Clinical Research Training**--discuss the current and projected need for research and clinical training in the context of the five science panels; past and current problems in recruiting investigators in medical rehabilitation research; strategies for recruiting additional research personnel; and make recommendations for enhancing the current training programs.

- **Biomechanics, Ergonomics, and Engineering**--review and identify the interface of these areas of related research to medical rehabilitation research and identify opportunities for further progress.

- **Information Resources**--describe existing data systems relevant to medical rehabilitation research and expanded information coordination and dissemination needs.

- **Assessment and Epidemiology**--determine the information needed relative to the incidence, prevalence, and risk factors associated with disease and disability; review how disease relates to disability, and how disease modification relates to disability; determine how disability management modulates disease; identify new assessment tools to evaluate medical rehabilitation research outcomes; understand the application of assessment tools to outcomes; and feature a variety of research models to study how best to minimize the impact of trauma on disability and disease.

V. SUMMARY OF RECOMMENDATIONS BY THE TASK FORCE ON MEDICAL REHABILITATION RESEARCH

APPENDICES

TASK FORCE MEETING SCHEDULE

Meeting of the Task Force on Medical Rehabilitation Research	June 28-29
Initial Stages of Task Force Report Drafting	July 2-30
Follow-up Meeting of Overall Task Force Co-chairs and Panel Co-chairs to Discuss the Draft Report of the Task Force (Optional)	August 10
Final Draft of Task Force Report Sent to Task Force Members for Review	September 5
Preparation of Final Draft of Task Force Report	September 17
Report Distributed for Review and Comment to ICDs and OD Staff and Concerned Organizations	September 28
External Comment and Review Period Completed	October 12
Final Report Printed and Made Available for Distribution	October 14
Task Force Report Reviewed by the Advisory Committee to the Director, NIH	November
Task Force Report Transmitted to DHHS	December

MEDICAL REHABILITATION RESEARCH PLAN

Task Force Mandate

The mandate of the Task Force on Medical Rehabilitation Research is to develop a comprehensive long-range research plan that identifies:

- the current state of the knowledge in the area, including significant recent research accomplishments;
- medical rehabilitation research program goals;
- the major scientific opportunities in medical rehabilitation research;
- the major clinical opportunities in medical rehabilitation research; and
- recommendations, priorities, and strategies for pursuing research program goals and research opportunities within the NIH.

SUMMARIES OF NIH INSTITUTE, CENTER,AND DIVISION SUPPORT
FOR MEDICAL REHABILITATION RESEARCH
FISCAL YEAR 1989

To assist the Task Force, the NIH Institutes, Centers, and Divisions were requested to provide individual project summaries for the rehabilitation research projects that they supported in FY 1989. Information was collected for the following six areas: neurophysiological dysfunction, musculoskeletal disorders, cancer rehabilitation, geriatrics, developmental issues in rehabilitation, and medical rehabilitation training. Institutes were further asked to designate each project as "Major" (over 50% rehabilitation research) or "Minor" (under 50% rehabilitation research) and to indicate whether research was extramural or intramural.

This section (Tab F) contains information obtained from the following Institutes:

National Institute of Neurological Disorders and Stroke (NINDS)
National Institute on Aging (NIA)
National Heart, Lung, and Blood Institute (NHLBI)
National Cancer Institute (NCI)
National Institute of Child Health and Human Development (NICHD)
National Institute of Dental Research (NIDR)
National Center for Research Resources (NCRR, formerly Division of Research Resources)
National Center for Nursing Research (NCNR)
National Institute of Arthritis and Musculoskeletal and Skin Diseases (NIAMS)
National Eye Institute (NEI)
National Institute of General Medical Sciences (NIGMS)
National Institute on Deafness and Other Communication Disorders (NIDCD)
Clinical Center (CC)

The information includes:

- a table showing overall medical rehabilitation research funding levels for each Institute, and
- a group of tables showing the details of funding by Institute for each area listed above.

Tab G contains a compendium of project summaries for specific panel areas.

Please note:

- In order to reduce the bulk of the background material, each Panel has been provided with only those project summaries in its own area of interest. No separate project listings have been given to the cross-cutting panels dealing with biomechanics, information resources, and assessment. Most members of these panels will have listings from their science panel background information.

- Institutes were asked to report only projects in the categories listed above. The definition of medical rehabilitation research for the purposes of the Task Force deliberations is based on the legislative language surrounding rehabilitation research, which specifically excludes hearing, vision and mental retardation research.

  Several of the NIH Institutes support substantial numbers of research projects in these excluded areas. Specifically, the NICHD funds over $14,000,000 in mental retardation research. Likewise, NINDS identified 7 projects totalling about $865,000 that did not fit within the Task Force definition of medical rehabilitation research. Summaries of these excluded NICHD and NINDS research projects will be placed in the library for the Task Force meeting.

  Other Institutes that mentioned excluding projects based on the current definition were NCRR, NHLBI, and NIDCD. The National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) funds no research in the areas requested for the Task Force.

- The NIAMS had several projects that fell into two categories of medical rehabilitation research. These projects are shown in both categories.

- All projects reported by the Clinical Center are funded through the management fund, which is provided by the individual NIH Institutes. No project summaries are available for Clinical Center projects.

TOTAL FY 1989 MEDICAL REHABILITATION RESEARCH
SUPPORTED BY NIH INSTITUTES, CENTERS, & DIVISIONS

	Neurophysiological Dysfunction	Musculoskeletal Disorders	Cancer Rehabilitation	Geriatrics	Developmental Issues in Rehabilitation	Basic & Clinical Research Training	Institute Total for Med. Rehab. Research (Dollars)
NINDS	9,516,073					129,075	9,645,148
NIA				10,148,013		327,961	10,475,974
NHLBI		508,984					508,984
NCI			10,643,636			379,482	11,023,118
NICHD	110,804				7,059,074	55,409	7,225,287
NIDR		92,486	74,967	784,804	4,335,435		5,287,692
NCRR	2,251,515	1,872,217	19,274	1,253,526	465,766		5,862,298
NCNR		816,577	203,565	455,886	242,674	12,500	1,731,202
NIAMS	456,995	13,634,509	157,104	9,867,252	197,720	376,008	24,689,588
NEI	1,892,045						1,892,045
NIGMS					45,000		45,000
NIDCD	604,406			86,737	113,855	385,877	1,190,875
CC	160,800	295,400	195,500	17,400	94,900	31,200	795,200
NIH TOTAL (Dollars)	14,992,838	17,220,173	11,294,046	22,613,618	12,554,424	1,697,512	80,372,611

FY 1989 MEDICAL REHABILITATION RESEARCH SUPPORTED BY THE NIH

NEUROPHYSIOLOGICAL DYSFUNCTION

		EXTRAMURAL		INTRAMURAL		
	TOTAL $	MAJOR	MINOR	MAJOR	MINOR	# GRANTS
NINDS	9,516,073	4,877,908	3,623,198	1,014,967	--	82
NICHD	110,804	110,804	--	--	--	1
NCRR	2,251,515	74,338	2,177,177	--	--	113 (154)
NIAMS	456,995	160,050	296,945	--	--	6
NEI	1,892,045	1,672,587	219,458	--	--	17
NIDCD	604,606	--	391,138	213,468	--	6
CC	160,800	--	--	160,800	--	--
TOTAL	14,992,838	6,895,687	6,707,916	1,389,235		225 (154)

( )subprojects

FY 1989 MEDICAL REHABILITATION RESEARCH SUPPORTED BY THE NIH

MUSCULOSKELETAL DISORDERS

		EXTRAMURAL		INTRAMURAL		
	TOTAL $	MAJOR	MINOR	MAJOR	MINOR	# GRANTS
NHLBI	508,984	508,984	--	--	--	3
NIDR	92,486	92,486	--	--	--	1
NCRR	1,872,217	131,824	1,740,393	--	--	90 (143)
NCNR	816,577	659,126	157,451	--	--	8
NIAMS	13,634,509	9,116,908	4,517,601	--	--	81
CC	295,400	--	--	295,400	--	--
TOTAL	17,220,173	10,509,328	6,415,445	295,400		183 (143)

FY 1989 MEDICAL REHABILITATION RESEARCH SUPPORTED BY THE NIH

CANCER REHABILITATION

	TOTAL $	EXTRAMURAL MAJOR	EXTRAMURAL MINOR	INTRAMURAL MAJOR	INTRAMURAL MINOR	# GRANTS
NCI	10,643,636	2,455,662	6,394,974	1,390,000	403,000	165
NIDR	74,967	74,967	--	--	--	1
NCRR	19,274	--	19,274	--	--	4 (5)
NCNR	203,565	158,937	44,628	--	--	2
NIAMS	157,104	--	157,104	--	--	1
CC	195,500	--	--	195,500	--	--
TOTAL	11,294,046	2,689,566	6,615,980	1,585,500	403,000	173 (5)

( )subprojects

FY 1989 MEDICAL REHABILITATION RESEARCH SUPPORTED BY THE NIH

GERIATRICS

	TOTAL $	EXTRAMURAL MAJOR	EXTRAMURAL MINOR	INTRAMURAL MAJOR	INTRAMURAL MINOR	# GRANTS
NIA	10,148,013	6,534,931	2,690,199	787,151	135,732	35
NIDR	784,804	387,581	--	397,223	--	4.5
NCRR	1,253,526	--	1,253,526	--	--	29 (39)
NCNR	455,886	351,452	104,434	--	--	3
NIAMS	9,867,252	2,202,389	7,664,863	--	--	51
NIDCD	86,737	--	86,737	--	--	1
CC	17,400	--	--	17,400	--	--
TOTAL	22,613,618	9,476,353	11,799,759	1,201,774	135,732	123.5 (39)

( )subprojects

FY 1989 MEDICAL REHABILITATION RESEARCH SUPPORTED BY THE NIH

DEVELOPMENTAL ISSUES IN REHABILITATION

	TOTAL $	EXTRAMURAL MAJOR	EXTRAMURAL MINOR	INTRAMURAL MAJOR	INTRAMURAL MINOR	# GRANTS
NICHD	7,059,074	7,059,074	--	--	--	42
NIDR	4,335,435	3,938,212	--	397,223	--	18.5
NCRR	465,766	1,555	464,211	--	--	49 (61)
NCNR	242,674	164,648	78,026	--	--	3
NIAMS	197,720	--	197,720	--	--	1
NIGMS	45,000	--	45,000	--	--	2
NIDCD	113,855	113,855	--	--	--	1
CC	94,900	--	--	94,900	--	--
TOTAL	12,554,424	11,277,344	784,957	492,123		116.5 (61)

( )subprojects

FY 1989 MEDICAL REHABILITATION RESEARCH SUPPORTED BY THE NIH

BASIC AND CLINICAL RESEARCH TRAINING

		EXTRAMURAL		INTRAMURAL		
	TOTAL $	MAJOR	MINOR	MAJOR	MINOR	# GRANTS
NINDS	129,075	129,075	--	--	--	2
NIA	327,961	274,775	53,186	--	--	6
NCI	379,482	379,482	--	--	--	9
NICHD	55,409	55,409	--	--	--	1
NCNR*	12,500	--	12,500	--	--	3
NIAMS	376,008	376,008	--	--	--	6
NIDCD	385,877	385,877	--	--	--	6
CC	31,200	--	--	31,200	--	--
TOTAL	1,697,512	1,600,626	65,686	31,200		33

*NCNR has 3 active training awards, but only one received funds from FY 1989 allocations.

SEE TAB H FOR INFORMATION ON BASIC AND CLINICAL RESEARCH TRAINING SUPPORTED BY THE NIH

NATIONAL INSTITUTES OF HEALTH

SUPPORT FOR MEDICAL REHABILITATION RESEARCH

BASIC AND CLINICAL RESEARCH TRAINING

FISCAL YEAR 1989

CRISP REPORT FORMAT F...

-PROJECT NUMBER.....5K08NS01162-03

IRG/INTRAMURAL UNIT..NSPA
AWARD AMOUNT.....$74,229

PI ADDRESS
GOLDSTEIN, LARRY B
BOX 3821, DEPT OF MEDICINE
DUKE UNIVERSITY MED CTR
DURHAM, N C 27710

INSTITUTION.....DUKE UNIVERSITY
TITLE Biochemical receptor studies in stroke (rats, rabbits)

Catecholaminergic systems have been implicated in both the pathogenesis of stroke and the recovery of function after ischemic injury. This proposal is designed to further elucidate the structure, regulation and function of the a1-adrenergic receptor (a1-AR) for catecholamines. a1-AR mediated events may play a role in the control of the cerebral circulation in man. In addition, the a1-AR may directly influence cellular metabolism through the putative second messengers inositol trisphosphate and diacylglycerol. This may be important for the understanding of neuronal growth, plasticity and altered neurotransmission.

The work has three specific aims: 1) to develop technologies for the purification of the necessary quantities of receptor protein, 2) to raise antibodies directed against the a1-AR and, 3) to develop a system for the reconstitution of the a1-AR into phospholipid vesicles.

Purification of the receptor protein will be accomplished through sequential affinity chromatography, wheat germ agglutinin chromatography, and high performance steric-exclusion liquid chromatography. Purified receptor will then be employed to immunize rabbits for the production of antibodies. A reconstitution system will provide a means of assaying the activating function of the receptor and a way of studying the mechanisms by which the receptor-effector system is regulated.

Combined with previous work, the availability of these biochemical tools will permit further study of the a1-adrenergic receptor at the molecular level.

-PROJECT NUMBER.....2K04NS00942-05

IRG/INTRAMURAL UNIT..CMS
AWARD AMOUNT.....$54,846

PI ADDRESS
ROSENBAUM, DAVID A
UNIV OF MASS
DEPT OF PSYCHOLOGY
AMHERST, MA 01003

INSTITUTION.....HAMPSHIRE COLLEGE
TITLE Cognitive control of movement (human)

The principal investigator will intensify and expand his basic research on the cognitive events that precede and allow for the performance of voluntary movements, and he will apply the research to the analysis of movement disorders. Toward fulfillment of the clinical objective, he will audit courses and engage in clinical research with two or more neurologists.

Five projects will be pursued:

(1) Planning of aimed hand movements. The aim of this new experimental procedure is to determine how people plan a series of aimed hand movements immediately after seeing a display specifying the targets to which movements must be aimed.
(2) Cognitive control of movement sequences. This project is the proposed renewal of the PI's NSF grant and consists of two parts: (a) The three-dimensional analogue of project (1) above, where the focus is on planning reaching and manipulation, both in normal and clinical (especially apraxic) populations; (b) Analysis of two recently discovered motor "illusions" that shed light on the mechanisms of serial ordering of behavior.
(3) Internal representation of the body surface. By having subjects perform a new speeded discrimination task in which all possible pairs of test sites serve as targets and distractors, the data can be analyzed with multidimensional scaling to allow for "visualization" of the body representation. Pilot work has turned up effects of handedness and posture.
(4) A book. A textbook, "Human Movement Control," will be written. The book will provide an overview of research and treatment pertaining to each of the major activity systems (e.g., Walking, Looking, Speaking, Writing, Reaching and Grasping.
(5) Cognitive Darwinism. Darwin's theory of natural selection will be applied to cognitive function. The key notion is that spontaneous variation in cognitive structures may provide a basis for generalization, preparation, and other important phenomena.

REPORTING FORM #2

ICD: NIA

PROJECT TITLE: Identifying Fall Related Factors

IDENTIFY SCIENCE AREA/TRAINING: Research and Clinical Training

MAJOR/MINOR EMPHASIS: Major

PRINCIPAL INVESTIGATOR: Mary E. Tinetti

INSTITUTION: Yale University

PROJECT NUMBER: 5 K08 AG00292-05

FY 1989 AWARD AMOUNT (associated with medical rehabilitation research): $61,544

ABSTRACT:

The major research project is the first prospective study of fall related factors in a sample of independently living elderly persons. The study, which involves an initial evaluation, a fall diary, bimonthly phone contact, and a partial reevaluation will examine the relative roles of chronic disabilities, acute stresses, and environmental hazards in fall etiology.

Two other future fall related projects include a fall intervention trial based on the results of the upcoming study and a project addressing the problem of fear of falling. Substudies from the data generated in the major project are also anticipated.

Examples of other age related research projects at Yale University include: the Yale Health and Aging Project (Drs. Ostfeld and Berkman), development of resource utilization groups for LTC (Drs. Cooney and Smits), and an observational study of indwelling catheters in nursing homes (Dr. Miller). Also, Dr. Feinstein, with the help of the geriatric group, will be applying his clinimetric skills to the area of functional assessment.

Clinical and teaching opportunities (which are coexistent in large part) include, but are not limited to: the acute rehabilitation unit at Yale New Haven Hospital, the geriatric evaluation clinic, medical consultation at a LTC facility, and attending at several Yale affiliated hospitals.

Plans for the next few years include expansion of the geriatric clinic into a multidisciplinary evaluation clinic, development of a geriatric fellowship, and increased collaboration with other university and community people interested in aging from ethical, medical, economic, nursing, social, and basic science perspectives.

The applicant's strength lies in the association with, and support from, the excellent clinical epidemiology group (including the sponsor Dr. A. Feinstein), the Public Health and Epidemiology faculty interested in aging (Drs. Ostfeld, L. Berkman, and H. Smits), and the small but strong geriatric subdivision within the General Medicine Section (Drs. L. Cooney, R. Miller, and applicant). The applicant completed a geriatric and clinical epidemiology fellowship at the University of Rochester before

-PROJECT NUMBER.....5 K08 AG00292-05 (Continued)

joining the Yale faculty. During that fellowship she designed and conducted a preliminary fall study. In addition, geriatrics at Yale has a strong commitment from Dr. Thier, chairman of the Department of Medicine.

REPORTING FORM #2

ICD: NIA

PROJECT TITLE: Behavioral vs. Drug Intervention for Urinary Incontinence

IDENTIFY SCIENCE AREA/TRAINING: Research and Clinical Training

MAJOR/MINOR EMPASIS: Major

PRINCIPAL INVESTIGATOR: Kathryn L. Burgio

INSTITUTION: University of Pittsburgh

PROJECT NUMBER: 1 K04 AG00431-01A1

FY 1989 AWARD AMOUNT (associated with medical rehabilitation research): $45,100

ABSTRACT:

Urinary incontinence in the elderly is a major problem with significant medical, psychological, and social consequences. Previous research on urge incontinence, a common form of incontinence, has demonstrated that behavioral interventions and drug treatments are effective for many individuals. However, it is clear that no one method has been 100% effective and all methods have disadvantages.

This project will be a prospective, randomized trial comparing the effects of behavioral training, drug therapy (oxybutynin) and placebo on urge incontinence in ambulatory, community-dwelling women aged 55 years and older. Although the two treatments have been studied individually, their effects have never been compared. Approximately 390 women will be evaluated for participation with the expectation that 195 will complete the protocol. Stratified and blocked randomization procedures will be used to assign subjects to 4 sessions (8 weeks) of biofeedback-assisted behavioral training, 4 sessions (8 weeks) of treatment with oxybutynin, or 4 sessions (8 weeks) of placebo. The study will also evaluate the combined effects of the two interventions and characterize patients on clinical variables that may influence outcome.

The candidate was a fellow at the Gerontology Research Center, N.I.A. or six years during which time she focused her research on the development and testing of behavioral methods for the treatment of urinary and fecal incontinence. In her new position as Director of Research at the Benedum Geriatric Center at the University of Pittsburgh, Department of Medicine, she plans to extend her research on incontinence. Her short term goals are to further evaluate and improve treatment methods for incontinence. Her long range career goals involve continued investigations of urinary incontinence in collaboration with faculty and fellows in geriatrics, nursing, neurology, urology, rehabilitation and gynecology. She hopes to establish herself as an expert in the field of incontinence, and to expand her research to other problem areas in behavioral geriatrics.

REPORTING FORM #2

ICD: NIA

PROJECT TITLE: Geriatric Leadership Academic Award

IDENTIFY SCIENCE AREA/TRAINING: Research and Clinical Training

MAJOR/MINOR EMPHASIS: Major

PRINCIPAL INVESTIGATOR: Jacob A. Brody

INSTITUTION: University of Illinois, Chicago

PROJECT NUMBER: 5 K07 AG00384-05

FY 1989 AWARD AMOUNT (associated with medical rehabilitation research): $81,623

ABSTRACT:

The University of Illinois is seeking the Academic Leadership award as part of a series of initiatives to improve and enhance the geriatric and gerontology research presence within the University of Illinois system. Dr. Brody, during his career as a member of the commissioned corps of the United States Public Health Service, developed a distinguished reputation in a number of epidemiologic research endeavors, including slow viruses, alcoholism and aging. As the first Associate Director of the Epidemiology, Demography and Biometry Program of the National Institute on Aging, Dr. Brody developed an international reputation for his studies in aging. During his time as Director of EDBP, Dr. Brody conducted studies on Alzheimer's Disease (the New Haven and East Boston Studies) as well as studies on the functional, physical and mental status among the aged in the Framingham, Massachusetts and Honolulu, Hawaii longitudinal studies. Additionally, Dr. Brody helped to expand the federal data base on the aging, and because of his knowledge in this area, helped to direct the development of a macro-economic model for planning and detection of trends in health care and costs. This grant will permit Dr. Brody to concentrate his expertise by allowing him to devote energy to the expansion and development of collaborative research at the University of Illinois. Among the research projects which are planned as part of this development are a Data Analysis Unit, which will invest its energy in the analysis of large national Federal and non-Federal data sets, as a means of improving our understanding of the aging process. Additionally, Dr. Brody plans to participate in studies within the School of Medicine focusing on bone metabolism, osteoporosis and hip fracture, as well as the effects of rehabilitative medicine on the aged. Dr. Brody will also work toward establishing collaborative relationships with other schools and colleges within the University, such that these additional units will also begin to invest time and energy in research on the aging. Further, Dr. Brody will move to develop a research training grant which will seek fellows from across the various schools and colleges of the University. These fellows will be encouraged to develop collaborative research projects which will combine the various

-PROJECT NUMBER.....5 K07 AG00384-03 (Continued)

basic sciences with the behavioral sciences, the clinical sciences and the humanities. Through this effort, the University of Illinois hopes to develop a unique gerontology and geriatric research presence focused on helping the aging improve their quality of life.

REPORTING FORM #2

ICD: NIA

PROJECT TITLE: Exercise Conditioning in Older Coronary Patients

IDENTIFY SCIENCE AREA/TRAINING: Research and Clinical Training

MAJOR/MINOR EMPASIS: Major

PRINCIPAL INVESTIGATOR: Philip A. Ades

INSTITUTION: University of Vermont

PROJECT NUMBER: 5 K08 AG00426-02

FY 1989 AWARD AMOUNT (associated with medical rehabilitation research): $67,608

ABSTRACT:

The studies detailed in this research plan are designed to prospectively investigate the magnitude and mechanism of the physiologic adaptations that occur when older patients with coronary heart disease (CHD) participate in a 3-month and a 12-month program of aerobic exercise conditioning. A control group will consist of nonexercising older CHD patients. Central to this project is the capacity of CHD patients, age 62 years and older, to adapt to an aerobic exercise program with an increase of maximal aerobic capacity as measured by maximal exercise oxygen consumption, and by an increase submaximal endurance capacity as measured by an exhaustive submaximal exercise protocol. Submaximal indices of conditioning, such as heart rate-blood pressure product and blood lactate concentration at a given workload, will also be emphasized as they are applicable to daily activities. Cardiac adaptations to training will include radionuclide ventriculographic indices of left ventricular performance, corrected for measures of ventricular loading conditions, as well as measures of submaximal and maximal exercise heart rat-blood pressure product, and index of myocardial oxygen demand. Peripheral adaptations to training will include measures of post-ischemic exercise calf blood flow and conductance and muscle biopsy sample for determination of capillarity and oxidative enzyme activity and glucose stores. Blood lactate determination during the exhaustive submaximal endurance protocol will assess adequacy of skeletal muscle oxygenation during exercise.

Preliminary data from our laboratory suggests that older CHD patients obtain a similar relative training benefit as younger CHD patients yet are far less likely to participate in an organized cardiac conditioning program. Entry level data (clinical, demographic, psychosocial) will be analyzed to determine predictors of participation and nonparticipation in an exercise-based rehabilitation program for older coronary patients.

REPORTING FORM #2

ICD: NIA

PROJECT TITLE: Aging with a Disability: The Late Effects of Polio

IDENTIFY SCIENCE AREA/TRAINING: Research and Clinical Training

MAJOR/MINOR EMPASIS: Major

PRINCIPAL INVESTIGATOR: Jessica Scheer

INSTITUTION: National Rehabilitation Hospital, Washington, D.C.

PROJECT NUMBER: 5 F32 AG05447-02

FY 1989 AWARD AMOUNT (associated with medical rehabilitation research): $14,000

ABSTRACT:

No Abstract Available

REPORTING FORM #2

ICD: NIA

PROJECT TITLE: Natural History and Folk Etiology of Age-Related Disorders

IDENTIFY SCIENCE AREA/TRAINING: Research and Clinical Training

MAJOR/MINOR EMPHASIS: Minor

PRINCIPAL INVESTIGATOR: Linda S. Mitteness

INSTITUTION: University of California, San Francisco

PROJECT NUMBER: 5 K04 AG00274-05

FY 1989 AWARD AMOUNT (associated with medical rehabilitation research): $53,186

ABSTRACT:

The proposed research program will further the development and testing of hypotheses concerning the management of age-related diseases. These hypotheses depend on careful contextual description of the natural histories of age-related diseases and the analysis of folk etiologies or explanatory models held by both laymen and professionals. This research has begun with an investigation of the behavioral contexts of urinary incontinence among the relatively healthy community-living elderly.

The proposed next step of the research program is the description and analysis of the natural history of urinary incontinence among the frail, homebound elderly. The research program will then be extended in two directions: expansion of the hypotheses developed through the analysis of urinary incontinence to other age-related disorders, and testing of these hypotheses through intervention research that focuses on both behavior change and change of folk etiologies held by elderly patients and their health providers. The initial expansion of the basic research component of the research program will be an examination of doctor-patient communications surrounding age-related disorders. The intervention component of the research program will include clinical trials of behavioral interventions for stress incontinence and mixed-etiology stress incontinence among elderly women. This research will examine both patient and provider behavior change and the effect of each on the effectiveness of treatment of stress incontinence.

In order to achieve the goals of this research program, the researcher will combine the ongoing research tasks with certain training components. First, she will obtain further training in the basics of human anatomy, physiology, and pathology. The second area of knowledge acquisition will be in methodological and theoretical aspects of sociolinguistics, in preparation for the analysis of doctor-patient communication. The third activity that is vital preparation for this research program will focus on the research groundwork necessary for the design of observational research in the clinical setting. This will include attention to logistical, ethical and methodological constraints of this particularly difficult research site as well as the further development of collaborative research ties with geriatricians.

ICD: National Cancer Institute

PROJECT TITLE: Biobehavioral Control of Chemotherapy Side Effects

IDENTIFY SCIENCE AREA/TRAINING: Rehabilitation Training

MAJOR/MINOR EMPHASIS: Major - 100%

PRINCIPAL INVESTIGATOR: Gary R. Morrow

INSTITUTION: University of Rochester

GRANT NUMBER: K04 CA01038-05

FY 1989 AWARD AMOUNT: $49,692

ABSTRACT:

This research is directed toward optimizing currently available behavioral interventions for side effect control, developing a new technology for nausea assessment and increasing understanding of side effect etiology.

ICD: National Cancer Institute

PROJECT TITLE: Articulatory Dynamics in Orofacial Cancer Patients

IDENTIFY SCIENCE AREA/TRAINING: Rehabilitation Training

MAJOR/MINOR EMPHASIS: Major - 100%

PRINCIPAL INVESTIGATOR: Rebecca Leonard

INSTITUTION: University of California, Davis

GRANT NUMBER: K04 CA01125-03

FY 1989 AWARD AMOUNT: $53,568

ABSTRACT:

The intent of this project is to describe thoroughly the speech characteristics of a wide variety of orofacial cancer patients, including those with partial or total glossectomy, mandibulectomy, maxillectomy and/or more extensive facial excisions. Data obtained from analyses of acoustic, aerodynamic, biomechanical and perceptual characteristics of speech in these patients will provide the basis for attempts to model both the nature and degree of speech impairment in orofacial cancer. It is expected that information resulting from these studies will direct the formulation of principles useful to the prognostic and therapeutic management of speech rehabilitation in this patient population.

ICD: National Cancer Institute

PROJECT TITLE: Behavioral Intervention for Children with Cancer

IDENTIFY SCIENCE AREA/TRAINING: Rehabilitation Training

MAJOR/MINOR EMPHASIS: Major - 100%

PRINCIPAL INVESTIGATOR: Lonnie K. Zeltzer

INSTITUTION: University of California at Los Angeles

GRANT NUMBER: K04 CA01268-06

FY 1989 AWARD AMOUNT: $52,272

ABSTRACT:

This grant has enabled the investigator to continue a number of her studies. One part of her efforts focused on an intervention study of nausea and chemotherapy-related distress in children. Another part examined family factors contributing to children's reactions to the stress of treatment. A new pilot study will be undertaken to assess the roles of the biologic basis of temperament and parent/child interaction in children's response to stress.

ICD: National Cancer Institute

PROJECT TITLE: Behavioral Correlates of Cancer Pain

IDENTIFY SCIENCE AREA/TRAINING: Rehabilitation Training

MAJOR/MINOR EMPHASIS: Major - 100%

PRINCIPAL INVESTIGATOR: Diana J. Wilkie

INSTITUTION: University of California, San Francisco

GRANT NUMBER: F31 CA08256-04

FY 1989 AWARD AMOUNT: $12,500

ABSTRACT:

The general focus for this doctoral research program is the interaction of the psychosocial behavioral aspects with biological parameters of cancer pain.

ICD: National Cancer Institute

PROJECT TITLE: Optimizing Cognitive Function in Patients with Cancer

IDENTIFY SCIENCE AREA/TRAINING: Rehabilitation Training

MAJOR/MINOR EMPHASIS: Major - 100%

PRINCIPAL INVESTIGATOR: Bernadine E. Cimprich

INSTITUTION: University of Michigan

GRANT NUMBER: F31 CA08390-03

FY 1989 AWARD AMOUNT: $12, 500

ABSTRACT:

The purpose of the proposed doctoral research is to study conditions which influence the differential use of attention processes during chronic or life-threatening illnesses.

ICD: National Cancer Institute

PROJECT TITLE: Is Visual Imagery an Adjunctive Cancer Therapy?

IDENTIFY SCIENCE AREA/TRAINING: Rehabilitation Training

MAJOR/MINOR EMPHASIS: Major - 100%

PRINCIPAL INVESTIGATOR: Janice E. Post-White

INSTITUTION: University of Minnesota

GRANT NUMBER: F31 CA08430-02

FY 1989 AWARD AMOUNT: $12,500

ABSTRACT:

This is an ambitious doctoral research program to investigate the effect of mental imagery on immune function and cancer outcome.

ICD: National Cancer Institute

PROJECT TITLE: Spirituality and Meaning of Life in Cancer Patients

IDENTIFY SCIENCE AREA/TRAINING: Rehabilitation Training

MAJOR/MINOR EMPHASIS: Major - 100%

PRINCIPAL INVESTIGATOR: Elizabeth A. Johnston

INSTITUTION: University of Pennsylvania

GRANT NUMBER: F31 CA08431-02

FY 1989 AWARD AMOUNT: $12,500

ABSTRACT:

The purpose of this doctoral research is to capture the essence of spirituality, or at least one aspect of it (search for meaning) through an examination of patients' perceptions. The researcher has proposed using a phenomenological framework and methodology. This description of spirituality and meaning in life will encourage further research as well as provide a guide to nurses working in this area.

ICD: National Cancer Institute

PROJECT TITLE: Perception of Support in Parents of Children with Cancer

IDENTIFY SCIENCE AREA/TRAINING: Rehabilitation Training

MAJOR/MINOR EMPHASIS: Major - 100%

PRINCIPAL INVESTIGATOR: Holly A. Williams

INSTITUTION: University of Florida

GRANT NUMBER: F31 CA08681-02

FY 1989 AWARD AMOUNT: $0

ABSTRACT:

The two major aims of this doctoral research program are to gain more understanding about why certain families experiencing childhood cancer appear to have more social support than others and to use this understanding to help families maximize their social support.

ICD: National Cancer Institute

PROJECT TITLE: Psychiatric and Pain Research Training in Cancer

IDENTIFY SCIENCE AREA/TRAINING: Rehabilitation

MAJOR/MINOR EMPHASIS: Major - 100%

PRINCIPAL INVESTIGATOR: Jimmie C. Holland

INSTITUTION: Memorial Hospital for Cancer & Allied Diseases

GRANT NUMBER: T32 CA09461-06

FY 1989 AWARD AMOUNT: $173,950

ABSTRACT:

This award represents the NCI's only ongoing research training grant in the area of pain and the psychological aspects of cancer. The principal preceptors of this grant are Doctors Holland, Foley and Sidtis. The training tracks, which often overlap, are in pain research, with projects concentrating on pharmacologic or clinical aspects, in psychiatric studies exploring the impact of cancer and its treatment on patients' and their families' psychological and biological function, and in neuropsychology studies assessing the cognitive and neurophysiologic effects of cancer and its treatment.

07285 04

5 T32 HD07285 04 ALTEMEIER, WILLIAM A	RESEARCH TRAINING PROGRAM IN BEHAVIORAL PEDIATRICS VANDERBILT UNIVERSITY		HLB NASHVILLE, TENNESSEE	FY: 89	$55,409
(**07285 04		1	$55,409		
(**GRAND TOTAL		1	$55,409		

07032 12

5 T32 HD07032 12 MENTAL RETARDATION MRDD
BUCHWALD, NATHANIEL A UNIVERSITY OF CALIFORNIA LOS ANGELES LOS ANGELES, CALIFORNIA FY: 89 $177,981
(**07032 12 1 $177,981

07176 10

5 T32 HD07176 10	MENTAL RETARDATION RESEARCH TRAINING IN PSYCHOLOGY	MRDD	FY: 89	$106,703
DETTERMAN, DOUGLAS K	CASE WESTERN RESERVE UNIVERSITY	CLEVELAND, OHIO		
**07176 10	1 $106,703			

07184 11

2 T32 HD07184 11 MENTAL RETARDATION MRDD
BORKOWSKI, JOHN G UNIVERSITY OF NOTRE DAME NOTRE DAME, INDIANA FY: 89 $83,918
1 $83,918
**07184 11

07226 11

2 T32 HD07226 11 RESEARCH BEHAVIORAL SCIENTISTS IN MENTAL RETARDATION MRDD
WARREN, STEVEN F VANDERBILT UNIVERSITY NASHVILLE, TENNESSEE FY: 89 $159,968
**07226 11 1 $159,968

07262 06

2 T32 HD07262 06 ELLIS, NORMAN R	MENTAL RETARDATION UNIVERSITY OF ALABAMA IN TUSCALOOSA		MRDD TUSCALOOSA, ALABAMA	FY: 89	$53,210
*07262 06	1	$53,210			
*GRAND TOTAL	5	$581,780			

REPORTING FORM #2

ICD: NCNR

PROJECT TITLE: Quality of Life in Cardiac Rehabilitation Patients

IDENTIFY SCIENCE AREA/TRAINING: Research and Clinical Training

MAJOR/MINOR EMPHASIS: (Expected to be major)

PRINCIPAL INVESTIGATOR: Lazar, Nanci C.

INSTITUTION: Rush University

PROJECT NUMBER: F31 NR06130

FY 1989 AWARD AMOUNT (associated with medical rehabilitation research): $0

ABSTRACT:

Purpose of the study is to provide a descriptive foundation regarding what connotes issues of quality of life for the cardiac rehabilitation patient population. The applicant bases the need for the study on the importance of determining quality of life in outcome studies of rehabilitation programs. A review of the literature reflects various views of the construct "quality of life", primarily from literature of the late 1970's until the present, and the various tools. Plans are to examine quality of life as it relates to life events, decision making, subsequent interventions and the general recovery from chronic cardiovascular disease. The applicant expects to use both qualitative and quantitative methods. (Pre-doctoral award)

REPORTING FORM #2

ICD: NCNR

PROJECT TITLE: Spinal Cord Injury Patients, Nursing Environment and Care

IDENTIFY SCIENCE AREA/TRAINING: Research and Clinical Training

MAJOR/MINOR EMPHASIS: (Expected to be major)

PRINCIPAL INVESTIGATOR: Nelson, Audrey L.

INSTITUTION: University of Florida

PROJECT NUMBER: F31 NR06099

FY 1989 AWARD AMOUNT (associated with medical rehabilitation research): $0

ABSTRACT:

The purpose of the proposed research is to explore aspects of nursing environments on spinal cord injuries (SCI) units within VAMC which enhance or inhibit nursing care and patient outcomes. An organization analysis model will be used which looks at social system, technology, external environment, dominant coalition, formal organizational arrangements and employees. The applicant plans to use both qualitative and quantitative methods. Data will be collected through observations, interviews, questionnaires, and a review of unit designs. The sample will be SCI units within the VA system. (Pre-doctoral award)

REPORTING FORM #2

ICD: NCNR

PROJECT TITLE: Recognizing Depression Following Stroke

IDENTIFY SCIENCE AREA/TRAINING: Research and Clinical Training

MAJOR/MINOR EMPHASIS: Minor

PRINCIPAL INVESTIGATOR: Whitney, Fay

INSTITUTION: University of Pennsylvania

PROJECT NUMBER: F31 NR06187

FY 1989 AWARD AMOUNT (associated with medical rehabilitation research): $12,500

ABSTRACT:

The purpose of the proposed study is to characterize depressive signs and symptoms experienced by strike patients at different points in time throughout recovery. The specific aims are: 1) to characterize signs and symptoms of stroke patients with lesions at different sites; 2) to examine the relationships among site of the lesion, time since the stroke and depressive signs and symptoms over time, and 3) to explore differences in caregiver and family perceptions of patient depression.

A prospective, longitudinal design will be employed to characterize post-stroke depressive responses in a convenience sample of 386 stroke patients. Four hospitals will be used as a source of patients who will be studied at two weeks, 3 months and 6 months after stroke. A standardized battery of tools (Beck Depression Scale, MAACL-R, Zung), and an investigator developed measure (Comprehensive Mood Index: CMI) will be used to provide a comprehensive examination of the depressive signs and symptoms seen in these patients. Demographic, clinical, CT scan and functional outcome data will be used to describe the population, to locate lesion site, and to consider confounding variables relative to depression. Paired family members, and nurses caring for the patient will also be studied (using the CMI) to ascertain differences in perception of the presence and degree of depression the patient suffers.

Data analyses will include: 1) descriptive statistics to characterize the population studied and the depression in relation to site of lesion; 2) multivariate techniques with repeated measures to examine the relationship of site of the lesion and length of time since the stroke to depression followed by univariate analyses if significant differences are found, 3) multivariate analyses with repeated measures to examine differences in perceptions of depression between patients, nurses and family work will provide clinicians caring for stroke patients with information which will assist them in detecting depression in these patients so that referral and treatment are more accurate. This can lead to increased quality of life for these patients and their families.

DETAILED DESCRIPTION OF RESEARCH TRAINING PROGRAM

1. GENERAL OVERVIEW

The UCLA program amphasizes the great need for both basic and applied clinical research in the field of total-joint replacements and skeletal implants. As such, the research interests span areas extending from the study of the physical interactions between opposing man-made articulating surfaces to the biological response of bone to dynamically-loaded skeletal implants. The aim in this program is to bring together the necessary expertise to attack the problem in the clinical setting. In this way the real problems and limitations involved in patient care are realistically and continuously being re-evaluated. This is an essential part of any bioengineering training program, whether it is approached from the clinical or engineering disciplines.

2. FACULTY

The senior clinical faculty involved in this program includes Drs. Amstutz, Cracchiolo and Finerman, with additional support provided by Dr. Moreland (Junior Staff Surgeon) and Dr. Mirra (Assistant Professor, Pathology). The Biomechanics Research Section within the Division of Orthopedics is engaged full-time in research and clinical development work involving various aspects of the total-joint replacement program at UCLA. This faculty group includes two engineers with considerable experience and knowledge in laboratory supervision, teaching and research, K. Markolf, Ph.D. and I. Clarke, Ph.D. They are very ably supported in these by two research engineers, H. McKellop, M.S. and Al Hodgson, M.S., with support from the biological side by T. Gruen, M.S. (Staff Research Associate). The various research projects currently being developed by these individuals are well illustrated in the bibliography.

3. FACILITIES

Center for Health Sciences: This center includes the clinical, surgical and radiograph facilities of the orthopedic division within a large modern research hospital. Included in the orthopedic suite is a specialized histopathological laboratory under the responsibility of Dr. J. Mirra. This is currently equipped with a Faxitron x-ray system, a Trimatic automatic tissue processor, tissue band-saw, Spencer microtome H.I. microtome-blade sharpener, P.S. processing oven and freezer/refrigerator facilities. The microscopic facilities include a Leitz system with transmitted/reflected light facilities, polarizing and fluorescing modes and integral photometer system.

The microscopic facilities in our Biomechanics Research Section under the responsibility of Dr. Clarke include a Bausch and Laumb stereo microscope/camera unit, a Natchet system with transmitted/reflected-light facilities, polarizing, differential interference-contrast and interferometry modes with Nikkon photometer and camera system. The scanning electron microscope (Cambridge Stereoscan Mk IIa) with an x-ray analyzer (Kevex Corp.) attachment is located in the Materials Science Dept. on campus.

The Biomechanics Research Section (Director, Dr. Markolf) also includes a well-equipped machine shop, an electronics and instrumentation laboratory and a materials evaluation laboratory containing an MTS Model 812 servohydraulic materials testing machine. This machine can achieve actuator velocities of up to 50 inches/sec for single cycle load applications. The maching is capable of stroke control (for failure testing) or load control (for fatigue testing). Failsafe options provide for system shutdown when the specimen fractures or when the load falls below a predetermined level Associated oscilloscope (with camera) or x-y plotter consoles are available for recording tests data. Conventional back-up facilities, equipment and supplies are available for the preparation and mechanical evaluation of connective tissues and bones.

The research activities also routinely utilize the Division of Animal Surgery Laboratories (H. Frankenberg, Center for Radiological Research (H. Snow, D.V.M., Direc facilities in the Department of Radiological Sciences/Nu Director) and the Prosthetics-Orthotics Educational Prog Bray, P.O.).

CLINICAL TRAINING

X MAJOR ___ MINOR

REHAB $ 66530

DESCRIPTION: State the application's broad, long-term objectives and specific aims, making reference to the health relatedness of the pro... Describe concisely the experimental design and methods for achieving these goals. Avoid summaries of past accomplishments and the... of the first person. This abstract is meant to serve as a succinct and accurate description of the proposed work when separated from... application. DO NOT EXCEED THE SPACE PROVIDED.

The purpose of the UCSD Residency Training Program continues to be to provide training for the practice of general orthopaedic surgery but also to provide the necessary training for inclusion of academic orthopaedics within the range of career choices of graduates. The Training Grant program is designed to meet the training needs of postdoctoral trainees in both Orthopaedics and Biomechanics. Selection of residents at this institution is biased toward applicants with academic goals. The clinical program strengths beyond general orthopaedics and fractures include: children's orthopaedics, rehabilitation, implant surgery, amputee rehabilitation, spine surgery, sports medicine, and hand surgery.

The scope of research training includes biomechanics, biochemistry, morphology, and muscle physiology, and interstitial fluid mechanics. Emphasis is on interdisciplinary collaboration on projects with ultimate or immediate clinical relevance. Neurophysiology will be added in the forthcoming year with the recruitment from UCLA of Dr. Sue Bodine-Fowler. Correlative coursework to each of these fields is available on the UCSD campus and such coursework will be tailored to the individual trainee's needs. A Master's and Ph.D. degrees are presently offered in Biomechanics.

Our goal is to maintain the necessary flexibility to provide the best training platform for bioengineers and orthopaedic residents so that the unmet personnel needs in academic orthopaedics can be narrowed. Flexibility is required to tailor a specific program to the particular needs and interests of each trainee. The diversity of faculty talents and interests available has allowed us to match the program with the trainee in most instances.

KEY PERSONNEL ENGAGED ON PROJECT

NAME, DEGREE(S), SSN	POSITION TITLE AND ROLE IN PROJECT	DEPARTMENT AND ORGANIZATION
W. H. Akeson, M.D. 480-24-7275	Professor/Program Director	Surgery/Orthopaedics
J. J. Abitbol, M.D. 603-14-4827	Assistant Adjunct Professor	Surgery/Orthopaedics
D. Amiel, Dip. Ing. 567-52-3991	Associate Adjunct Professor	Surgery/Orthopaedics
M. Botte, M.D. 564-80-6742	Assistant Professor (IR)*	Surgery/Orthopaedics
S. Bodine-Fowler, Ph.D. 556-17-2475	Assistant Professor (IR) (Proposed)	Surgery/Orthopaedics
F. R. Convery, M.D. 536-24-8912	Professor	Surgery/Orthopaedics
R. Coutts, M.D. 567-52-3991	Associate Adjunct Professor	Surgery/Orthopaedics
S.R. Garfin, M.D. 474-50-6565	Associate Professor	Surgery/Orthopaedics
D. H. Gershuni, M.D. 567-47-6846	Professor (IR)	Surgery/Orthopaedics
F. Golbranson, M.D. 538-36-2131	Clinical Professor	Surgery/Orthopaedics
M. Kwan, Ph.D. 053-64-2749	Assistant Professor (IR)	Surgery/Orthopaedics
R.L. Lieber, Ph.D. 554-70-9009	Assistant Professo. (IR)	Surgery/Orthopaedics
V. Nickel, M.D. 541-14-5611	Clinical Professor	Surgery/Orthopaedics
D. Sutherland, M.D. 519-16-7322	Professor (IR)	Surgery/Orthopaedics
S. Woo, Ph.D. 552-62-1643	Professor	Surgery/Orthopaedics
E. Zinberg, M.D. 094-42-3338	Assistant Professor (IR)	
		University of California, San Diego

*IR - in Residence

CLINICAL TRAINING

X MAJOR ___ MINOR

REHAB $ 34020

in this application. X MAJOR ___ MINOR

3. Program Plan REHAB $ 138,302

This combined training program is specifically designed to train candidates with MD, PhD and predoctoral degrees who intend to pursue academic careers in basic research with application to clinical problems in disorders of the locomotor system. Training occurs through intensive participation in specific research projects, as well as participation in coursework, conferences and seminars (see Appendices 1, 2) sponsored individually or conjointly by the cooperating groups.

Postdoctoral fellows in rheumatology take a 36-month training program. Of the 36 months, 12 months are utilized for clinical training in the rheumatic diseases and are not supported by the training grant. The 24-month research training period is devoted to basic research with special, but not exclusive emphasis, in cell biology and biochemistry of cartilage, or in immunology.

The orthopaedic and tissue biomechanics training program selects both predoctoral and postdoctoral fellows to participate in a research program. The postdoctoral appointments in orthopaedic research are designed for one to three year periods of training, with multiple-year fellowships strongly recommended. Predoctoral appointments are for three years and require the intent on the part of the trainee to complete a PhD program in orthopaedic engineering. Each trainee selects a specific project and preceptor in areas of bone transplantation, immunology of bone/cartilage, cartilage cell biology and biochemistry, and tissue biomechanics as they apply to the musculoskeletal system.

Eight trainees (2 predoctoral, 6 postdoctoral) will be selected for the training grant program in a given year. Predoctoral candidates are integrated into the existing graduate program of the Department of Mechanical and Aerospace Engineering; three postdoctoral fellows will be appointed in rheumatology, and 3 postdoctoral trainees in orthopaedics. This mix varies depending on the goals of the candidates and projects in progress. Both predoctoral candidates, and postdoctoral trainees and fellows undertake laboratory research projects under the direct guidance of their sponsors. These projects provide extensive experience in a wide variety of current laboratory techniques in the biological areas, including cell culture, development and maintenance of cell lines, production and utilization of monoclonal antibodies, column chromatography, gel electrophoresis, thin layer chromatography, fluorescence microscopy, utilization of the fluorescence-activated cell sorter, and radioimmunoassay.

In the tissue biomechanics and orthopaedic areas, techniques available for the trainee to experience include: microvascular surgical techniques, mechanical property measurements of bone and cartilage, image analysis and morphometry, histologic techniques, immunologic concepts, calcium and collagen chemistry, animal surgical techniques, and computation and statistical evaluation utilizing state-of-the-art computer techniques.

Three types of program tracks are offered: (1) a postdoctoral fellowship in the rheumatic diseases for physicians who have completed a residency training program in internal medicine, for 2 to 3 years which will include

both course work and laboratory experience in arthritis; (2) a postdoctoral program for orthopaedic trainees designed to give postdoctoral fellows one or two research years of training and experience in both theoretical and applied problems in musculoskeletal diseases; and (3) a predoctoral program for graduate students who wish to acquire a PhD in tissue biomechanics, specifically oriented toward research in musculoskeletal diseases. These three defined tracks which emphasize physician traineeships do not exclude applicant PhD fellows for training in the Division of Rheumatology or Department of Orthopaedics.

Weekly laboratory meetings, formal lectures, grand rounds, seminars and conjoint conferences and research-related coursework are provided for all trainees (see Appendices 1, 2). In weekly laboratory meetings, week-to-week progress in experiments is reviewed. Formal lectures in the basic sciences of cell biology, biochemistry and immunology are also available through formal coursework, medical grand rounds, seminars by local and visiting faculty, and conjoint conferences with the collaborating programs. Further, weekly seminars in immunology in which CWRU and guest faculty present their research are scheduled. A weekly journal club in the Division of Rheumatic Diseases provides an ongoing update of the scientific literature in the above disciplines.

In addition, there are two series of weekly departmental research seminars, during which time each trainee presents the progress on his/her research to the entire research faculty of the musculoskeletal training units. During these sessions both formal and informal critiques of ongoing research are performed.

Weekly teaching conferences are held in clinical areas which have appropriate relationships to each one of the research areas. The trainees attend clinical conferences which are available both in the Department of Orthopaedics and the Division of Rheumatic Diseases (see Appendix). These conferences are designed to integrate both the clinical and basic sciences as they apply to musculoskeletal pathology. However, the individual trainee has limited patient responsibility, not to exceed 10% of total time during his/her tenure as a research trainee.

The monitoring of the curriculum and review of research projects are the responsibility of the co-directors and Steering Committee. Although it is not the charge of the committee to develop research proposals or to reject projects in progress, it is appropriate for this committee to review individual projects and to pass on their educational value to the trainee. In this regard, the committee serves as an advisor and advocate of the trainee in the project. Another endeavor of the committee is to monitor the progress of the trainee and to provide counseling whenever necessary. The trainee's advisor meets with him/her on a regular basis to discuss the research, and the committee also meets semi-annually with both the advisor and the trainee. The purpose of these meetings is to evalute the progress and maturation of the trainee and to assist the advisor in the development of a tailored program for each trainee.

In the case of postdoctoral research fellows in rheumatology, an interim objective examination covering the basic and clinical sciences is administered in order to evaluate the performance of these physicians. Each trainee with responsibilities in the Department of Orthopaedics is required to

take the Orthopaedic In-Training Examination. Post-test feedback sessions are an integral part of this process. The specific program is changed as deemed appropriate by these feedback sessions. Using these mechanisms, the Steering Committee and the advisor reach a judgment as to whether the trainee has made reasonable and sufficient progress in research endeavors. Since emphasis is given to bridging the basic and clinical sciences, the committee weighs heavily the capacity of the trainee to integrate and to apply basic techniques and concepts to disease-related research.

The predoctoral training program is designed to produce PhD's, which are firstly fully competent in the engineering discipline of applied mechanics. Secondly, the graduates are to develop a special expertise in the applications of the principles of applied mechanics to understanding the behavior of the musculoskeletal system and its problems. The third goal is to strengthen the commitment to an academic career involving musculoskeletal research, which the trainees must necessarily express in order to enter the program.

The typical predoctoral trainee is either a two or three year appointee, who has completed an MS program. Typically, this program has had a biomechanics emphasis and the candidate has been through either the Mechanical and Aerospace Engineering or Biomedical Engineering program. In order to have proficiency in mechanics, the typical postdoctoral trainee takes the following courses or equivalents: Elasticity, Advanced Dynamics, Experimental Stress Analysis, and Applied Mathematics. With this background, trainees typically then take at least one advanced course in both the Mechanics of Materials, e.g. Viscoelasticity or Plasticity; Dynamics, e.g. Advanced Dynamics II or Advanced Vibrations; and Advanced Mathematics. All trainees also take the three courses: Functional Anatomy, Biomechanics of the Musculoskeletal System, and Mechanics of Biological Continua. Beyond these courses, trainees take courses which suit their own research specializations and interests. These areas would ordinarily be one of the following: Continuum Mechanics, Structural Mechanics, Dynamics and Kinematics.

Academic regulations for the PhD program include a basic science requirement of 6 hours of courses in the math of basic science departments, and a breadth requirement of 12 hours of courses taken outside of the department and area of specialization.

The third area of training, in addition to the course work and dissertation research, is the participation in a variety of local seminars and meetings (see Appendix). Graduate students attend the weekly Locomotor Seminars and the weekly meetings of the Orthopaedic Engineering Laboratory. At these meetings, current research activities, including their own, are presented. The additional weekly meetings in the Orthopaedic Engineering Laboratories which they can attend are the Bone Biomechanics Seminar and the Musculoskeletal Motion Seminar, in which current topics from the literature are discussed. As well, the trainees have access to most of the clinical and basic science conferences for Orthopaedics and Rheumatology.

4. Trainee Candidates

Selection criteria which are used to judge candidates include: (a) intent to enter academic medicine or related research; (b) academic excellence; (c) academic and clinical performance during residency; (d) prior

research experience; and (e) letters of recommendation.

The admission requirements for matriculation into the program are as follows: 1) Predoctoral candidates: BS and/or MS in engineering; 2) Postdoctoral trainees in orthopaedics: MD/MD-PhD, commitment to academic and research career; 3) Postdoctoral fellow in rheumatic diseases: MD, completion of an approved residency in Internal Medicine, special interest in arthritis research.

Greater than 75% of all postdoctoral trainees come from the CWRU School of Medicine and the residency programs of the Departments of Medicine and Orthopaedics of University Hospitals of Cleveland. Of the 144 graduates of CWRU School of Medicine each year, a significant number choose to remain in the Cleveland area for postdoctoral training. There are 100 residents in the three-year program in internal medicine, which combines University Hospitals and the Wade Park Veterans Administration Medical Center. A three-year medical residency at Cleveland Metropolitan General Hospital includes 50 physicians. Approximately 90% of the residents leaving these clinical training programs choose a subspecialty, and the majority elect one to three years of laboratory experience in addition to the clinical specialty training.

With regard to formal applications for training, approximately 25 to 30 inquiries regarding rheumatology fellowship training are received each year. Of these, 10 to 15 applicants formally apply and are interviewed. Of those interviewed, 2 to 3 academic clinical candidates, and 1 to 2 research candidates are accepted per year at various levels.

The Department of Orthopaedics annually receives between 325 and 425 applications for residency positions. Of these, up to 10% express a desire to enter an academic career with an emphasis on basic research of musculoskeletal problems. In bioengineering, approximately 15 to 25 applications are made per year for pre- and post-doctoral research fellowships.

At the postdoctoral level, we anticipate that of the 10 MD-PhD combined degree candidates per medical school class, one or more would plan to pursue a research interest in biomechanics related to musculoskeletal diseases. Pre-PhD applicants for the orthopaedic engineering component come through the Mechanical and Aerospace Engineering Department and the Biomedical Engineering Department. A very large pool of applicants each year presents 10 or more highly qualified persons with a specific interest in biomechanics.

Predoctoral Candidates: Predoctoral candidates make formal application to the PhD program through either the Mechanical and Aerospace Engineering Department or through the Biomedical Engineering Department. Normally names of all candidates for graduate studies at either the MS or PhD level who indicate an interest in biomechanics are provided to Dr. Davy or Dr. Mansour for follow-up if appropriate. In addition a number of prospective students make direct contact with the Orthopaedic Engineering Lab. We provide guidance on formal application to them. For recruitment purposes, we also provide information regarding research and support opportunities.

Postdoctoral Candidates: Postdoctoral fellows in bioengineering typically come from 1) direct contact with the Orthopaedic Engineering Laboratory, or 2) through the Orthopaedics Department.

In addition to recruitment from this institution, attempts are made to recruit qualified candidates from elsewhere in the United States. This is accomplished by advertising in clinical and basic science journals such as Science, Journal of Orthopaedic Research, Journal of Immunology and the like, as well as through related national research meetings.

As in the past, targeting of the recruitment of minority candidates at all training levels is emphasized. Such emphasis is made in all advertisements, and in verbal communication with faculty within our own university and with faculty from other institutions. Recruitment guidance is sought from the Office of Minority Affairs of CWRU and of the Dean's Office at the School of Medicine.

Trainee candidate application statistics for the past 5 years are presented in Table 2 (pp 87-89).

5. Training Support

Table 3 (p 90) lists current and pending other training support including funding source, name of the program director, project period, number of trainee positions and a list of those faculty also named in this application.

C. CURRENT AND PAST RESEARCH TRAINING RECORD

The Division of Rheumatic Diseases comprises 7 full-time MD rheumatology/researchers and 5 PhD basic research faculty. Research activities of this unit (see Appendix 3) include major research commitments to studies of cartilage metabolism/pathophysiology in normal and disease states (osteoarthritis and inflammatory arthritis); studies of pathogenesis of osteoarthritis, utilizing experimental animal models (partial meniscectomy model of osteoarthritis; Psammomys obesus model of disc degeneration); studies of hormonal and enzyme interplays in experimental models of arthritis; studies of T-lymphocyte regulation in systemic lupus erythematosus; studies of molecular immunogenetics and animal models particularly as they relate to systemic lupus erythematosus; and studies of complement interactions in connective tissue disease.

Areas of targeted research interest by members of the Department of Orthopaedics (see Appendix 3), comprising 28 full-time faculty, include transplantation studies of cartilage and bone with evaluation of both vascularized and nonvascularized allografts; studies of microvascular surgical techniques and related pathophysiologic processes; studies of collagen metabolism and calcification processes of bone; development of improved hip and knee total joint prostheses based on techniques of defining basic stresses and strains that fall through these prostheses utilizing sophisticated telemetry; studies of mobility disorders including functional control of spasticity through electrical stimulation; mechanisms of spinal cord injury; studies of bioactive factors in skeletal repair; and basic studies directed toward utilization of marrow stem cells and embryonal cells in cartilage repair.

Research interests of the Department of Developmental Biology include physiology of articular cartilage, extracellular matrix biochemistry, role of bioactive factors in conversion of cartilage to bone, and lineage of osteogenic cells, topics of strong collaborative interest to rheumatology and orthopaedics.

SECTION IV
PROGRESS REPORT SUMMARY

GRANT NUMBER
2 AR 07555-03

PRINCIPAL INVESTIGATOR OR PROGRAM DIRECTOR
Roby C. Thompson, Jr.

FROM
07

CLINICAL TRAINING

APPLICANT ORGANIZATION
University of Minnesota

X MAJOR ___ MINOR

TITLE OF PROJECT *(Repeat title shown in item 1 on first page)*
Musculoskeletal/Orthopedics Sciences Training Program

REHAB $ 84406

(SEE INSTRUCTIONS)

1. The objectives and goals of the second year of our training grant have been to recruit qualified candidates to our program, to enroll them in our training program, and then to institute the training procedures outlined in our original proposal. We have been successful in filling our available slots of 4 M.D. and Ph.D. postdoctoral slots and 4 pre-Ph.D. slots with well qualified candidates. We are quite satisfied with the number of high quality applicants for the training positions, so we have a good choice from among the applicants to match our capabilities; we are especially pleased to see that we are attracting M.D. postdocs who are interested in spending 2 years full-time in research. During this year, we have initiated and have in operation (1) a weekly departmental research meeting, (2) a weekly laboratory research meeting, (3) a weekly osteoarthritis study group, and (4) a monthly journal club for research literature. The trainees participate in all of these, including oral presentation of their ongoing work.

2. Training Related Expenses were of special value to the training program. We used them to provide each trainee with a book fund, a research supplies fund, ads for the training program, copying costs for the trainees, and secretarial services for the training grant. Specific funds to the trainees are valauble because they encourage collecting a scholarly library and relevant computer software, and they make the training program attractive. Costs for secretarial services are especially useful so that the department does not have to bear too heavy a burden to support the training program, making it desirable to other members of the department.

3. Trainees appointed to the program during this reporting period:

Glenn Buttermann, M.D.: completed one year of general surgery residency prior to entering program; appointed 7-1-88 to 6-30-89

Gordon Walker, M.D.: completed one year of general surgery residency prior to entering program; appointed 7-1-88 to 6-30-89

Lata Sundaram, Ph.D.; Ph.D. in Biochemistry prior to entering program; appointed 7-19-88

Brian Maldonado, Ph.D.; Ph.D. in Biochemistry prior to entering program; appointed 12-16-88

Michele Chin-Purcell, M.S. in Mechanical Engineering prior to entering program; appointed 1-5-89 to 1-4-90

Steven Kirstukas, M.S. in Mechanical Engineering prior to entering program; appointed 7-1-88

Peter Mente, M.S. in Bioengineering prior to entering program; appointed 7-1-88

Alan Eberhardt, M.S. in Civil Engineering prior to entering program; appointed 12-16-88

Trainees completing their program:

32. Research Plan.

a. Abstract.

This study will investigate the strategies that are used during learning to obtain the movement invariances one observes in practiced movements. The structure of the neural control system must constrain what types of movement can be learned and how movements are learned. The study of limb kinematics during motor learning may reveal the movement parameters that are explicitly controlled by the nervous system. Quantitative changes in motor output will be measured as human subjects practice and learn simple throwing movements. The kinematics of the movement will be studied using a Watsmart System for measurement and recording of limb position over time and a Symbolics Lisp Machine, a computer work station, will be used for data analysis. To obtain some insight into the neuromuscular strategies used in motor learning, electromyographic (EMG) recordings will be obtained from the principle agonist and antagonist muscles. Motor learning will be investigated for both single-joint (elbow) and multi-joint (unrestrained arm) movements.

b. Specific Aims.

The overall objective of this research plan is to use the study of motor learning as a tool to understanding the neural control system. When the control system is asked to modify the performance of the mechanical system it may reveal the hidden processes which underlie both movement and learning. The study of adaptive change in the oculomotor and vestibulo-ocular systems has yielded invaluable information about the nature of the central nervous system control of eye movement (Keller and Zee, 1986; Miles, 1986). Similarly the study of motor learning can give us insight into the neural control of limb movement.

1) Experiments will be done to test the general hypothesis that regularities in motor performance emerge during motor learning. The invariant features of movement (for example, symmetry of the tangential velocity profile) could be present on the first trial and other aspects of the movement task could change over the practice trials. Alternatively, the invariant properties of practiced movements could change during learning. That is, the observed invariances could be learned phenomena, acquired through practice. The first outcome would imply that the neural control system is, in fact, highly constrained and that it generates only particular types of movements. The second outcome, i.e. invariant features appear at some stage of movement acquisition, would give us some insight into the control system by revealing how it adapts or changes.

The common assumption that with practice movements tend to be performed more smoothly and gracefully will be investigated. If this assumption is true, a quantitative measure of smoothness (the integral of the squared rate of change of acceleration) should decrease with the number of practice trials. In this task accuracy is determined by the release angle and the release velocity. Thus, an increase in "smoothness" during learning here may implicate invariant property of the control system, since theoretically, "smoothness" is not necessary for adequate completion of a throwing task.

2) A second hypothesis which will be addressed in these experiments is that when performing a novel task the stiffness about a given joint is increased. The combined effect of muscle mechanical properties and neural feedback gains will be measured

30. F. Abstracts

1. Markel MD, Richardson DW, Nunamaker DM. Comminuted first phalanx fractures in horses; surgical vs. non-surgical treatments. Vet Surg 14:59, 1985.

2. Markel MD, Meagher DM, Ford TS, McCullough CL. Colopexy of the equine large colon. In Second Equine Colic Research Symposium. Symposium abstracts, pp. 43, 1985.

3. Markel MD, Madigan JE. Vertebral body osteomyelitis in 5 horses. In Proceedings of the Third Annual Medical Forum, pp. 147, 1985.

4. Markel MD, Meagher DM, Ford TS. Colopexy 15:128, 1986. Surg

31. Not applicable

CLINICAL TRAINING

X MAJOR ___ MINOR

REHAB $ 31 750

32. Research plan.

A. Abstract

The evaluation of fracture healing, fracture union, and return of the bone to a normal state is a subjective assessment. Current methods of monitoring healing include manual examination of the fracture for stability, radiographic evidence of healing, the empirical passage of time, and the patient's evaluation of symptomatic pain. These subjective criteria may inadequately diagnose when a fracture is functionally stable, or conversely, when the healing process is delayed and progressing to non-union. A quantitative technique for evaluation of bone healing in vivo is needed to more accurately monitor the healing process. There have been many studies which attempted to measure bone mechanical properties and to quantitate bone mineral content non-invasively during different stages of experimental fracture healing. Most of these studies were unable to quantitate fracture healing, or did not correlate microradiography, histomorphometry, or the biomechanical strength of healing fractures with non-invasive measurements in experimental fracture models. In addition, the studies which have evaluated fracture healing in vivo primarily have looked at the later phases of fracture healing rather than the critical early phases, when important initial events in cell differentiation and matrix production are likely to occur. It is our aim to develop a quantitative method of evaluating both the early and late phases of fracture healing, and to correlate non-invasive measures with microradiography, histomorphometry, and the biomechanical strengths of the fracture. The proposed study will compare normal healing and delayed healing under stable external fixation induced by a small (800 μm) and a large (2 mm) osteotomy gap. We plan to investigate and attempt to validate three non-invasive methods for evaluation of fracture healing: 1) magnetic resonance imaging (MRI), 2) quantitative computed tomography (QCT), and 3) high resolution single photon absorptiometry with a prototype device. Magnetic resonance imaging is well suited for examination of soft tissues. To date, its greatest value in the musculoskeletal system is as an aid in diagnosing various bone tumors and ischemia of the femoral head. Although cortical bone is poorly imaged with MRI, other tissues such as trabecular bone, fibrous tissue, and cartilaginous tissue can be well defined. Magnetic resonance imaging may be a technique which will accurately quantify the earlier phases of fracture healing. Bone healing also will be quantitated using QCT and single photon absorptiometry. Recently, QCT has been shown to precisely measure the mineral content of trabecular and cortical bone. Single photon absorptiometry has been shown to very precisely quantitate bone mineral content. Our high resolution adaptation of the technique is designed for measurement of bone mineral in small bones, and appears to

suitable for the currently proposed study. These three non-invasive techniques will be used to monitor callus tissue differentiation, including the processes of endochondral and direct membranous ossification in a canine tibial osteotomy model. The fractures will be evaluated after euthanasia at different time periods using standard radiographs, biomechanical testing, histomorphometry, and microradiography. Data will be analyzed to determine if there are correlations between these three non-invasive methods and the in vitro measures of fracture healing at different stages. In this way, we hope to validate and possibly guide optimal utilization of these new techniques in the study of bone healing.

B. Specific Aims

The long-term goal of this research program is to establish non-invasive methods of evaluating fracture healing to more accurately predict which fractures are progressing to union following specific bone repair mechanisms, and which are destined to become delayed unions or non-unions. We hope to correlate tissue type and morphological structure with mineral content determined by MRI, QCT, and single photon absorptiometry. This first phase project will investigate the feasibility of MRI, QCT, and a new method of single photon absorptiometry to precisely monitor bone healing. Thus, for the proposed investigation, we will address the following hypotheses and specific aims:

1) Hypothesis: The early reparative phase of fracture healing can be non-invasively monitored and delineated using MRI.

Specific aim: Healing of canine tibial osteotomies will be evaluated with MRI to determine T_2 and T_1 relaxation times for normal and delayed healing. Different spin-echo imaging sequences will be used for quantitation, and to determine which sequence produces the best image for evaluating fracture callus.

2) Hypothesis: Bone fracture healing can be evaluated non-invasively using QCT.

Specific aim: Healing of canine tibial osteotomies will be evaluated with QCT to make a quantitative assessment of periosteal and interfragmental new bone formation and intracortical bone resorption. The method employs a contoured calibration phantom.

3) Hypothesis: Bone fracture healing and remodeling can be evaluated non-invasively using a more refined technique of single photon absorptiometry which allows sequential quantitation of bone mineral deposition at the fracture site.

Specific aim: Healing of canine tibial osteotomies will be evaluated with a high resolution single photon absorptiometry technique. This scanning technique will be used to provide the area distribution of mineral content in and around the fracture site during fracture repair and bone remodeling.

4) Hypothesis: MRI, QCT, and single photon absorptiometry are correlated with the biomechanical properties, histomorphometry, and microradiography of healing bone.

Specific aim: We will investigate this hypothesis using 36 dogs in a longitudinal study. Dogs will be divided into 6 groups with 6 dogs per group. Tibial osteotomies will be created bilaterally in the hind limbs of each dog and stabilized with small Orthofix external fixators. One tibia of each dog will be fixed in neutralization with a gap of 800 um, while the contralateral limb will be fixed with a gap of 2.0 mm; attempting to simulate normal gap and delayed healing mechanisms, respectively. Osteotomies will be evaluated radiographically every two weeks. Groups will be euthanatized

PROJECT TITLE: HPD - Laryngeal cancer localization and treatment (human, hamsters, dogs)
SCIENCE AREA/TRAINING: RESEARCH AND CLINICAL TRAINING
MAJOR/MINOR EMPHASIS: MAJOR
PRINCIPAL INVESTIGATOR: DAVIS, ROY K
INSTITUTION: UNIVERSITY OF WISCONSIN MADISONUTION: UNIVERSITY OF UTAH
PROJECT NUMBER: 8 K07 DC00004-05
FY 1989 AWARD AMOUNT (associated with medical rehabilitation research: $59,492

ABSTRACT:

The difference in concentration of hematoporphyrin derivative between normal epithelium, dysplastic epithelium, and invasive carcinoma will be investigated in the Syrian Golden Hamster. The ability of photoactive compounds to identify and treat severe epithelial dysplasia and squamous cell carcinoma in the larynx of pound dogs and patients with advanced squamous cell carcinoma will also be investigated.

Laryngeal cancer will be induced by spraying the larynx of hamsters on ethanol as their sole liquid diet with benzopyrene. After cancer induction hematoporphyrin derivative will be given intraperitoneally. Forty-eight hours later the animals will be sacrificed and the larynx studied histologically.

Laryngeal cancer will be induced in the dogs by giving weekly injections of 20-methylcholanthrene submucosally into one true vocal cord. The progression of carcinogenesis and the extent of the induced cancer will be determined clinically using microlaryngoscopy. After successful cancer induction hematoporphyrin derivative (HPD) will be given intravenously. Areas of fluorescence will be mapped and correlated to the clinical stage. Biopsies of fluorescent and non-fluorescent areas of the vocal cord with induced cancer will be compared. The endolarynx will then be treated using the argon dye laser. Six weeks later the cancer will be restaged and biopsied.

Patients with advanced squamous cell carcinoma of the head and neck who are not candidates for standard therapy will be given HPD as part of an already approved phase I, phase II study. The ability of photoirradiation therapy with HPD to treat the primary lesion will be studied. In addition, the ability of HPD to localize and treat areas of field cancerization beyond the primary lesion will be investigated. Use of HPD may significantly enhance the detection of dysplasia and early cancer and provide a selective, repeatable therapeutic method.

PROJECT TITLE: Pathophysiology of speech/swallowing disorders in ALS (human)
SCIENCE AREA/TRAINING: RESEARCH AND CLINICAL TRAINING
MAJOR/MINOR EMPHASIS: MAJOR
PRINCIPAL INVESTIGATOR: SUFIT, ROBERT L
INSTITUTION: UNIVERSITY OF CALIFORNIA LOS ANGELESUTION: UNIVERSITY OF WISCONSIN MADISON
PROJECT NUMBER: 8 K08 DC00018-04
FY 1989 AWARD AMOUNT (associated with medical rehabilitation research: $75,039

ABSTRACT:

The objective of this CIDA research is to specify the relations between the orofacial muscle deinnervation associated with amyotrophic lateral sclerosis (ALS) and the consequent functional disabilities that occur in speech and swallowing.

While the speech and swallowing symptoms associtated with ALS have been described, almost no studies have provided data to address extant hypotheses concerning: (1) the relative severity of the ALS degeneration process in the different cranial motor nerves, or (2) the critical relations among the electromyographic, histochemical strength, speech, and swallowing aberrations that are associated with that motoneuron degeneration.

Using five independent measures, data will be obtained longitudinally on a carefully selected population of 30 ALS patients and cross sectionally on a normal control group.

The first data set will highlight speech motor functions, including anlyses of the speech acoutstic signal, judgements of dysarthric severity, and measures of lip, jaw and tongue movements. Secondly, videofluoroscopic analyses will be conducted on swallowing functions. The third data set will be obtained via instrumental measurement of weakness in the lip, jaw, tongue, and wrist flexor muscle groups, while the fourth set of measures will include quantitative EMG indices of single motor unit changes typically associated with ALS in several critical muscles of the tongue, jaw, lips, and forearm. Finally, as postmortem muscle tissue becomes available from the ALS subjects, a fifth set of data will include the morphology and histochemistry of the above mentioned muscles.

These data will be analyzed to reveal critical causal relations between the orofacial neuromuscular pathophysiology associated with ALS and consequent problems in speech and swallowing.

PROJECT TITLE: Laser phototherapy for the treatment of malignancies (human, pig)
SCIENCE AREA/TRAINING: RESEARCH AND CLINICAL TRAINING
MAJOR/MINOR EMPHASIS: MAJOR
PRINCIPAL INVESTIGATOR: CASTRO, DAN J
INSTITUTION: GALLAUDET UNIVERSITYUTION: UNIVERSITY OF CALIFORNIA LOS ANGELES
PROJECT NUMBER: 8 K08 DC00031-02
FY 1989 AWARD AMOUNT (associated with medical rehabilitation research: $76,096

ABSTRACT:

Photodynamic therapy with lasers may become an attractive adjunctive modality for early diagnosis and treatment of superficial malignancies when fluorochromes with high tumor specificity and low toxicity are developed.

The specific aims of this study are to:

1. Develop a noninvasive, simple, accurate, and reproducible quantitiative method of dosimetry of laser induced damage in tissues. The beam scan technique will be developed to measure spatial profiles of laser beams. An infrared camera will allow measurement of thermal profiles in the porcine skin model after exposure to increasing levels of laser energies. Volume of damage will be quantitated by serial histological sections. Damage range constant, absorption coefficients and thresholds for lesions for the CO2, Argon and Nd:YAG lasers will be predicted. The "LAD" (laser absorptive dose) parallel to the RAD in radiology will be determined.

2. Define the basic intracellular events in laser "killing" of Rhodamine-123 sensitized human squamous carcinoma and melanoma cells in-vitro. Mitochondrial function, membrane potential and morphology will be assessed respectively by measuring oxygen consumption, 86Rb, 3H-thymidine assays and electron microscopy. ATP levels after laser and Rhodamine-123 phototherapy will be quantitated by luciferin-luciferase assays allowing measurement of mitochondrial oxidative phosphorilation.

3. Establish a randomized clinical protocol which will allow us to test the potentials of this new fluorochrome for the treatment of superficial malignancies of the head and neck with the Argon laser. Patients with recurrent Stage IV tumors (squamous cell carcinoma, melanoma) will be injected with a nontoxic, sensitizing dose of Rhodamine-123, then subjected to low energy Argon laser therapy. Optimal tumor response will be assessed according to the histological type, tumor size, dosages of Rhodamine-123, various laser energies and frequency of

CONTINUED ON NEXT PAGE

PROJECT NUMBER: 8 K08 DC00031-02 (Continued)
treatment. Potential local and systemic toxicity of Rhodamine-123 will be evaluated.

Our study promises to provide relevant information toward the elucidation of the mechanism of action of this promising new photochemosensitizing agent, and will define the potentials for treatment of human head and neck tumors. Furthermore, the basic unit of dosimetry that will be developed with the lasers ("LAD") will allow standardization of scientific clinical and biomedical research.

PROJECT TITLE: Adaptive capabilities of postural stabilizing reflexes (human)
SCIENCE AREA/TRAINING: RESEARCH AND CLINICAL TRAINING
MAJOR/MINOR EMPHASIS: MAJOR
PRINCIPAL INVESTIGATOR: HERDMAN, SUSAN J
INSTITUTION: BOSTON UNIVERSITYUTION: JOHNS HOPKINS UNIVERSITY
PROJECT NUMBER: 8 K08 DC00032-02
FY 1989 AWARD AMOUNT (associated with medical rehabilitation research: $52,314

ABSTRACT:

Disorders of balance, especially when they result in falls, are an important and common clinical problem. The cause of disequilibrium in many instances is dysfunction of the vestibulospinal reflexes but most clinical vestibular research has focused on the vestibulo-ocular reflex (VOR). Although much is known about the adaptive strategies used by labyrinthine-deficient humans to stabilize gaze, almost nothing is known about the adaptive strategies to stabilize posture. Accordingly, the long-term objective of our research is to understand better the adaptive capabilities of postural stabilizing reflexes (PSR) with the ultimate goal to improve the physical therapy treatment of patients with balance disorders. By studying both normal subjects and patients without labyrinthine function, we will develop testing paradigms and analysis techniques for PSR adaptation that are comparable to those that have been successfully used to study VOR adaptation. PSR adaptation will be studied by measuring 1) The amplitude of sway induced by a sudden perturbation of the support surface and 2) The amplitude of sway induced in response to a moving visual stimulus. These two approaches are of particular interest because they simulate conditions in which patients with labyrinthine deficits have complaints of imbalance. Our main approach will be to quantify fore-aft sway under conditions of artificial feedback to isolate the various sensory components that contribute to the postural stabilizing reflexes. To induce adaptation, subjects will wear reversing (dove) prisms or magnifying (X2) spectacles, both of which change the apparent motion of the environment during head rotation. We will compare adaptation of the VOR with that of PSR. The results of the test in normal subjects will be compared with the results from subjects with bilateral labyrinthine deficiencies. The results of this project will be applied to the design and the assessment of physical therapy programs for patients with balance disorders.

PROJECT TITLE: Communication device effect--conversational performance (human)
SCIENCE AREA/TRAINING: RESEARCH AND CLINICAL TRAINING
MAJOR/MINOR EMPHASIS: MAJOR
PRINCIPAL INVESTIGATOR: HIGGINBOTHAM, D JEFFERY
INSTITUTION: BOSTON UNIVERSITYUTION: STATE UNIVERSITY OF NEW YORK AT BUFFALO
PROJECT NUMBER: 1 K08 DC00034-01
FY 1989 AWARD AMOUNT (associated with medical rehabilitation research: $59,496

ABSTRACT:

This project attempts to address the gap between the technological development of Augmentative Communication Devices (ACDs) and our understanding of the cognitive and linguistic processing needed for their use. Towards this goal, I propose to study the influence of ACDs on the way users and their partners communicate. The research is aimed at determining the effects on communication of the type of device used as well as the permanancy, redundancy, and temporal/spatial characteristics of the message created by the device. These device related variables will be studied for their influence on (1) the user's ability to refer to subjects and events; (2) the receiver's ability to comprehend the message; (3) the user's and receiver's ability to manage the interaction, and (4) the judgments receivers and observers make about the competence of the ACD users. Based on the data obtained from these studies, a model of augmentative communication will be developed and evaluated for how well it predicts conversational performance in experimental and naturalistic contexts. Years 1-3 will involve the study of dyadic communication in a controlled experimental context. Nonhandicapped adults will serve as subjects to reduce the subject variability found among handicapped users. Research during years 3 and 4 will extend the experimental work to include single-subject studies of handicapped ACD users in both experimental and naturalistic settings. Finally, a prototype ACD will be developed using the findings of the studies. The overall aim is to develop a set of social communication specifications for the production of a new generation of socially appropriate communication technologies.

PROJECT TITLE: Head and neck carcinoma cell kinetics (human, mice)
SCIENCE AREA/TRAINING: RESEARCH AND CLINICAL TRAINING
MAJOR/MINOR EMPHASIS: MAJOR
PRINCIPAL INVESTIGATOR: COLTRERA, MARC D
INSTITUTION: BOSTON UNIVERSITYUTION: UNIVERSITY OF WASHINGTON
PROJECT NUMBER: 1 K08 DC00035-01
FY 1989 AWARD AMOUNT (associated with medical rehabilitation research: $62,640

ABSTRACT:

The overall goals of the project are to: a) study tumor cell kinetics in head and neck carcinomas using newly-developed monoclonal antibodies which identify proliferating cells in tissue sections and; b)develop a new classification system of head and neck tumors which integrates the slide-based cell kinetic information with traditional histologic and morphologic criteria. We hypothesize that this integrative tumor classification system will contain more accurate prognostic information than the present TNM/Stage I-IV system. A panel of currently available monoclonal antibodies which are specific for proliferating cells will be evaluated in frozen and fixed. Paraffin-embedded new and archival head and neck tumor specimens in order to systematically determine the fixation and immunostaining requirements of these antibodies. As none of the currently available proliferation-specific monoclonal antibodies can be used in formaldehyde-fixed, paraffin-embedded tissues, new proliferation-specific monoclonal antibodies capable of reacting with S-phase cells in archival formalin-fixed, paraffin-embedded tissue will be developed. Using immunocytochemical techniques with these antibodies and correlative flow cytometry, intratumor variations in cell kinetics in head and neck carcinomas will be studies. Prospective and retrospective studies of head and neck carcinomas and paraffin-embedded tumor specimens will be undertaken with the aim of correlating the cell kinetic data derived from immunocytochemical analysis of these tumors with such clinical endpoints as disease-free intervals, recurrences, metastases, survival.

The applicant is presently a head and neck surgery fellow in the Dept. of Otolaryngology at the University of Washington. After completion of this two year clinical/research fellowship in July of 1988, the applicant will be joining the department as an assistant professor, as he intends to pursue an academic career with a firm commitment to both bench research and clinical surgical oncology. A CIDA would make it possible for the applicant to complete the training and background studies necessary for independent investigation while maintaining

CONTINUED ON NEXT PAGE

PROJECT NUMBER: 1 K08 DC00035-01 (Continued)
clinical skills which are central to his future plans. Furthermore, it would afford him the opportunity of working within the Pathology Dept. of the Univ. of Washington in which there are many other researchers working at the interface of clinical medicine and tumor biology.

MEDICAL REHABILITATION

BACKGROUND

Section 405 of the PHS Act lists rehabilitation among other authorities of the National Institutes of Health (NIH) research institute directors. Many of the Institutes carry similar authority in their purpose clauses, and nearly all currently fund projects in this area of medical research.

Legislation to locate a center for medical rehabilitation research at NIH stems from the Congress' desire to provide a locus of greater support for the biomedical research aspects of the field. During the reauthorization process in the 100th Congress, both Representative Doug Walgren (D-Pa.) and Senator Edward M. Kennedy (D-Mass.) introduced legislation (H.R. 4013 and S. 2222, respectively) proposing a free-standing center for medical rehabilitation research within the National Institutes of Health (NIH). Although those provisions were not acted upon, conceptually similar legislation (H.R. 3819 and S. 1392) is pending in the 101st Congress.

CURRENT STATUS

Two major NIH-related bills have been introduced during the 101st Congress:

- S. 1392, the Biomedical Research Act of 1989, was introduced by Senator Edward Kennedy (D-Mass.) on July 24, 1989, and currently has eight cosponsors. Title II would establish a National Center for Medical Rehabilitation Research within NIH, for the conduct and support of biomedical research and research training, the dissemination of health information, and other programs with respect to the rehabilitation of individuals with physical disabilities resulting from diseases or disorders of the neurological, musculoskeletal, cardiovascular, or other physiologic system. Senator Kennedy has stated that locating a medical rehabilitation research center "in the rich biomedical environment of NIH...will greatly facilitate its achievements." The other titles are not related to rehabilitation research.

  S. 1392 was reported out of the Senate Labor and Human Resources Committee on November 7, 1989. The accompanying report stated that a major function of the newly proposed Center will be planning and coordination, and makes clear that the Committee expects allied health disciplines, such as speech and language, physical therapy, occupational therapy, and disciplines of psychology, engineering, counseling and social work, to be supported for training and research activities, and be included in the constituency for the Center.

- H.R. 3819, the Medical Rehabilitation Research Act of 1989, was introduced on November 21, 1989, by Representative Doug Walgren (D-Pa.) and referred to the Committee on Energy and Commerce. The measure currently has eight cosponsors. This bill would establish a National Center for Medical Rehabilitation Research within the National Institute of Child Health and Human Development, with its

purpose identical to that of the free-standing Center proposed in S. 1392. In his introductory remarks Representative Walgren stated, "The focus [of the Center] is intended to be on physical, not sensory, disability...[and] to assure that there is one accountable agency in the NIH responsible for developing a concrete plan for research on rehabilitation."

Congressional interest in other rehabilitation issues has also grown. Several bills related to disabilities and trauma care (involving improved emergency care services to reduce the number of disabilities resulting from physical trauma) have been introduced during this Congress. A list of select bills of interest to NIH is attached.

Attachment

Selected Bills Pertaining to Rehabilitation

- **S. 933**, the Americans With Disabilities Act (ADA) of 1989, was introduced by Senator Tom Harkin (D-Iowa) on May 11. This is a comprehensive bill that would prohibit discrimination in employment, public services, and public accommodations, on the basis of disability. The bill was referred to the Senate Committee on Labor and Human Resources, where it was reported out on August 2 and passed by the Senate on September 7. On May 22, 1990, the House voted to vacate the text of this bill and substitute the text of the House-passed version of H.R. 2273. S. 933 was then passed by the House by voice vote.

- **H.R. 2273**, a companion bill to S. 933, was introduced by Representative Tony Coelho (D-Calif.) on May 9. Now sponsored by Representative Steny Hoyer (D-Md.), the bill was revised, based on the engrossed (and subsequently amended) version of S. 933, which passed in the Senate September 7, and reported out of the Committee on Energy and Commerce March 13, 1990, with 245 cosponsors. On May 22, after an attempt to recommit the bill back to full committee for reconsideration failed, the House passed H.R. 2273 by a vote of 403 to 20. Immediately thereafter, the House took up consideration of S. 933, the Senate-passed version of the ADA, voting to vacate the text of S. 933 and substitute the text of the House-passed version. S. 933 then passed the House by voice vote.

- **H.R. 2666**, the Mildred and Claude Pepper Scholarship Act, introduced by Representative Pat Williams (D-Mont.) would establish a scholarship fund for hearing-impaired and other handicapped students. H.R. 2666 passed in the House on September 13 and in the Senate (with amendments) on November 16. A companion bill, **S. 1337**, was introduced simultaneously by Senator Bob Graham (D-Fla.).

- **H.R. 1602**, introduced by Representative Jim Bates (D-Calif.) on March 23, would establish a national clearinghouse on emergency medical services and trauma care, and would authorize the Secretary, HHS, to conduct and support research on this topic, provide technical assistance to State and local agencies, and establish guidelines for developing uniform reporting systems. This bill passed the House by voice vote as amended November 14, and was received in the Senate November 15, 1989. (Labor and Human Resources)

- **S. 15**, a companion bill to H.R. 1602, was introduced on January 25 by Senator Alan Cranston (D-Calif.). Hearings were held on July 25, 1989, and the bill was ordered reported with an amendment on February 28, 1990 (Rept. 101-292). The bill was placed on the Senate legislative calendar May 15.

- **H.R. 2919 and S. 1419**, the Claude Pepper Acts for Amputees, were introduced in late July, 1989, by Representative William Lehman (D-Fla.) and Senator Bob Graham (D-Fla.), respectively. Identical to **H.R. 758** (introduced by Claude Pepper in February 1989) these bills would amend the Rehabilitation Act of 1973 to authorize the Director of the National Institute on Disability and Rehabilitation Research to conduct research on the development of advanced technology prosthetic and orthotic devices. (House Education and Labor; Senate Labor and Human Resources)

- **H.R. 4039 and S. 2153**, the Disabilities Prevention Acts of 1990, were introduced February 21, 1990, by Representative Silvio Conte (R-Mass.) and Senator Tom Harkin (D-Iowa), respectively. These bills would authorize the Centers for Disease Control to carry out programs with public and nonprofit private entities for the prevention of disabilities and secondary conditions resulting from such disabilities. A public hearing on **H.R. 4039** was held March 19, and the bill was ordered reported by the full committee on May 15. (House Energy and Commerce; Senate Labor and Human Resources)

(Billing Code 4140-01)

DEPARTMENT OF HEALTH AND HUMAN SERVICES
National Institutes of Health

Notice of Meeting

Notice is hereby given that the Task Force on Medical Rehabilitation Research, a group of consultants convened to advise the Advisory Committee to the Director, NIH, will meet in public session on June 28 and 29, 1990 at the Hunt Valley Inn in Hunt Valley, Maryland. The meeting will begin at 8:00 a.m. each day and end at 5:00 p.m.

The purpose of the Task Force on Medical Rehabilitation Research is to develop a comprehensive research agenda and mission statement to enhance and to guide medical rehabilitation research at the NIH. In developing the research agenda and mission statement, the Task Force will address current research accomplishments in the area of medical rehabilitation, and outline research needs and opportunities. Individual Task Force members will serve on one of five science panels, as well as serve on one of four cross-cutting panels. The Task Force will consist of approximately 100 members with expertise in basic and clinical sciences from a broad variety of specialties, including physical medicine, physical therapy, biomedical engineering, and other allied health professions. Disabled consumers and individuals familiar with disability biomedical research issues will also serve on the Task Force.

At the conclusion of its work, the Task Force will transmit its report to the Advisory Committee to the Director, NIH, for review. Comments and questions related to the proposed meeting of the Task Force should be

addressed to Ms. Mary Demory, National Institutes of Health, Science Policy Analysis and Development Branch, Shannon Building, Room 218, 9000 Rockville Pike, Bethesda, Maryland 20892, 301-496-1454.

Dated: MAY 7 1990

/S/ William F. Raub, Ph.D.

William F. Raub, Ph.D.
Acting Director, NIH

TASK FORCE ON MEDICAL REHABILITATION RESEARCH
BASIC AND CLINICAL RESEARCH TRAINING BIBLIOGRAPHY

Thomas, Paul J., "Creating Opportunities in Rehabilitation Research Training", *J Rheumatology*, 14:90-91.

Creating Opportunities in Rehabilitation Research Training

J. PAUL THOMAS

Abstract. **To address a serious manpower shortage in rehabilitation research, the National Institute on Disability and Rehabilitation Research in 1986 created the Rehabilitation Research Career Award. This award is intended to support individuals with advanced clinical training for research careers in fields related to rehabilitation, including arthritis. The paper describes the 7 ingredients considered necessary for a qualified research training program in rehabilitation.** (*J Rheumatol 1987;* **(suppl 15) 14: 90-91)**

Key Indexing Terms:
REHABILITATION RESEARCH TRAINING
NATIONAL INSTITUTE ON DISABILITY AND REHABILITATION RESEARCH (NIDRR)

The National Institute on Disability and Rehabilitation Research (NIDRR) is the federal agency responsible for addressing national needs in rehabilitation through research by fostering opportunities for the pursuit of scientific inquiry and development of knowledge relevant to the problems of disability. As such, NIDRR is concerned with the development of a cadre of scientists trained in research related to rehabilitation. In recent years, the several concerned medical specialties have expressed to the NIDRR their major research training needs in rehabilitation. Interestingly, reports of the House and Senate Committees on Appropriations accompanying the NIDRR fiscal year 1985 appropriation recommended that NIDRR establish a rehabilitation research training program.

Terminal degrees awarded in medicine, and in some related professions, are basically clinical degrees which generally do not include the intensive research training necessary to support excellence in scientific investigation. The Association of American Medical Colleges, on the basis of a 1984 survey of recent graduates, reported that 56% of respondents believed they had been inadequately prepared in research techniques.

There are several medical specialities directly involved in the rehabilitation of disabled individuals, including neurology, orthopedics, rheumatology, physical medicine, cardiology, and others. Related fields such as physical and occupational therapy, nursing, psychology, and engineering also participate in the delivery of clinical rehabilitation services. In all of these disciplines there are relatively few physicians or other health professionals engaged in basic or clinical research related to rehabilitation. There is an urgent need to build capacity by attracting additional individuals to rehabilitation research as well as by enhancing the research credentials of those already interested or active in the field.

In 1986, the NIDRR announced a new priority in rehabilitation research training. It is titled the "Rehabilitation Research Career Development Award." The purpose of this proposed priority is to prepare individuals with advanced clinical training for research careers in fields related to rehabilitation. The intent of the program is to expand capability in the field of rehabilitation research. The program is intended to support qualified individuals as trainees, to provide for the costs of scientific mentorship and research supervision, direct costs of research, and costs of participation in professional conferences or other activities of collaboration with scientists in the field of rehabilitation research.

Based on our limited experience with the Rehabilitation Research Career Development Award, the ingredients of a program of excellence in research training should include the following:

(1) An individualized research training program within an environment that facilitates and enhances advanced training in rehabilitation research.
(2) The identification and recruitment of qualified clinicians from among candidates in medicine or other health fields who demonstrate a potential to attain leadership positions in rehabilitation research.
(3) The development of a curriculum with didactic instruction and participation in scientific activities under the leadership of a senior mentor.
(4) The utilization of adequate facilities, research staff, and resources of existing programs which have been demonstrated to be suitable for advanced research training.
(5) A career development program which provides longterm individual support for training with significant involvement

From the Medical Research Programs, National Institute on Disability and Rehabilitation Research, United States Department of Education, Washington, DC, USA.

J.P. Thomas, PhD, Director.

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in basic and clinical rehabilitation research at the doctoral or postdoctoral levels.
(6) The participation with colleagues in conferences and in collaborative investigations to include exposure to outstanding researchers and practitioners.
(7) An established methodology for evaluation of the research training program to include assessment of the recruitment, training methods, research experiences, and outcomes of the program.

I believe that federal resources and research training needs can be joined to provide an effective and broad based cadre of research manpower to improve treatment, rehabilitation and service delivery mechanisms for severely disabled persons. If we are truly committed to that objective, new scientific leadership must be developed and nurtured.