

CALIFORNIA COASTAL COMMISSION

45 FREMONT STREET, SUITE 2000
SAN FRANCISCO, CA 94105-2219
VOICE AND TDD (415) 904-5200



Tu 9a

DATE: August 26, 1999

TO: Coastal Commissioners And Interested Parties

FROM: Peter Douglas, Executive Director
Mark Delaplaine, Federal Consistency Supervisor

RE: U.S. NAVY, Surface Warfare Engineering Facility (SWEF)
Port Hueneme, Ventura County
Expert Review Panel Selection, SWEF Mediation

Staff Note: At the August 12, 1999, hearing on this matter the Commission expressed its frustration over the lack of resolution concerning selection of the final expert review panel member. The Commission directed its staff to contact interested experts and provide the Commission with a list of experts (and background information) willing to serve on the review panel. The Commission indicated it wished to make a selection of the final panel member from this list, after listening to any concerns raised as to the suitability of any particular potential expert to serve as a review panel member.

The Office of Ocean and Coastal Resource Management (OCRM), which is overseeing the mediation, has twice summarized the interagency agreements as including the expectation that the agencies would achieve a consensus on the panel selection. OCRM's November 6, 1998, memo on the agreement stated: "OCRM, the Navy and the Commission will agree on the make-up of the technical panel ...". OCRM's April 6, 1999, memo specified that the panel make-up and selection would occur as follows:

The Technical Panel

Make up of the Panel. The Panel should consist of 3-5 members. The Panel members need to be objective and not be substantially involved with the Department of Defense. At least one of the Panel members should have clearance to review classified materials. It is desirable that one of the Panel members have bio-medical expertise and one of the Panel members have wildlife expertise. Public agency Panel members are preferred, but, depending on availability of the public agencies, universities or private contractors may be selected.

Selection of the Panel. OCRM will solicit the participation of the candidates listed in the priority Panel pool, ... [see OCRM memo]. If 3-5 of the priority Panel pool candidates agree to participate, then the rest of the Panel pool will not be contacted. If OCRM

cannot obtain the participation of 3-5 participants from the priority Panel pool, OCRM will contact the candidates in the secondary Panel pool until 3-5 have agreed to participate. Once OCRM obtains commitments from the Panel selectees, OCRM will forward to the Commission and the Navy the names and background information of the selected Panel members. The Commission will review the Panel selection at the first Commission meeting after OCRM forwards the Panel names. The Commission and the Navy will then provide OCRM with their concurrence or objection with the Panel selection, immediately following that Commission meeting.

The panel members tentatively-agreed-to are as follows:

<u>Member</u>	<u>Affiliation</u>
Ed Mantipty	National Air and Radiation Laboratory, EPA
John D'Andrea	Brooks Air Force Base, Texas

Wildlife Expert

Robert Beason	State University of New York
---------------	------------------------------

Citizen Observer

Lee Quaintance

Additional potential members under consideration (resumes/curricula vitae (CVs) attached) include:

Ross Adey	UC Riverside
Joe Elder	National Health and Environmental Effects Research Lab, EPA
Henry Lai	University of Washington
John Leonowich	Batelle Pacific Northwest Division, Pacific Northwest National Lab

The Commission staff has contacted Dr. Lai and Dr. Adey, both of whom have indicated their willingness to serve as a panel member. In addition, OCRM indicates Dr. Elder is willing to serve. At the September Commission hearing, the Commission will offer the opportunity for any concerns to be voiced as to the suitability of any of these (or other) prospective panel members. As of the date of this mailing, Dr. Elder is the only candidate out of the four above about whom the Commission staff has not heard any concerns voiced, and, therefore, who may be acceptable to all interested parties.

Staff Recommendation: The staff recommends that the Commission select **Dr. Joe Elder** as the final panel member and direct its staff to forward a letter to OCRM expressing the Commission's acceptance of a review panel consisting of the above tentatively-agreed-to list, with the addition of Dr. Elder.

Attachments: Additional names of experts that have been considered, followed by resumes/CVs for Ross Adey, Joe Elder, Henry Lai, and John Leonowich. (Resumes for Ed Mantipty, John D'Andrea, and Robert Beason were attached to the July 22, 1999, staff memo for the August Commission meeting.)

Additional names under consideration

Source: OCRM

- Raymond Neutra (California Department of Health Services) (Bio-medical effects).
- Dr. Robert Liburdy (Lawrence Berkeley National Laboratory).
- Dr. Craig Byus (University of California Riverside).
- Dr. Asher Sheppard (Consultant to Judge Advocates on similar issues, Redlands, California).
- Carl Durney (Department of Electrical Engineering, University of Utah).
- James Manidakos, Jr. (Environmental Engineer, SRI International, Menlo Park, California).
- Ronald Petersen (Lucent Technologies/Bell Laboratories, Murray Hill, New Jersey).
- Richard Tell (Richard Tell Associates, Inc., Las Vegas, Nevada).
- Dr. Eleanor Adair (Senior Scientist, Brooks Air Force Base, Texas) (Bio-medical effects).
- Dr. John Osepchuk (Full Spectrum Consulting, Concord, Massachusetts).
- Peter Valberg (Gradient Corporation, Cambridge, Massachusetts).
- W. Arthur Guy (Bio-electromagnetics Consulting, Seattle, WA).

Source: Dr. Liburdy

- Dr. Ben Greenebaum, Univ. of Wisconsin
- Dr. George Harrison, Univ. of Maryland
- Dr. Henry Lai, Univ. of Washington
- Dr. Theodore Litovitz, Catholic Univ. of America
- Dr. Frank Prato, St. Joseph's Health Center (London Canada)
- Dr. Jesse Siskin, Univ. of Kentucky

CURRICULUM VITAE**William Ross Adey, M.D.**

July, 1998

Date of Birth: January 31, 1922
Place of Birth: Adelaide, Australia
Nationality: U.S.A.

Present Positions

Adjunct Professor of Biochemistry
University of California at Riverside

Distinguished Professor of Physiology
Loma Linda University School of Medicine
Loma Linda CA 92354

Education

University of Adelaide, M.B. and B.S. (Bachelor Medicine and Bachelor of Surgery (1943).
(Australian medical qualifying degree).

University of Adelaide, M.D., 1949. By thesis and submission of published research in clinical and fundamental neurophysiology

Honors

Nuffield Foundation Dominion Fellow in Medicine, Oxford, 1950.
Royal Society of London and Nuffield Foundation Fellow, 1956.
Judson Herrick Memorial Fellow, American Association of Anatomists, 1963.
Fellow, American Academy of Arts and Sciences, 1965.
Fellow, Institute of Electrical and Electronics Engineers, 1970, for: "Electronic techniques and principles in understanding brain organization and neural mechanisms."
D'Arsonval Medallist, Bioelectromagnetics Society, 1989.
Wellcome Trust Distinguished Visiting Professor, Royal Society of Medicine, London, 1996.
Sechenov Medallist, Russian Academy of Medical Sciences, Moscow, 1996.
Hans Selye Award, American Institute of Stress, 1999
P.K. Anokhin Centenary Medal, Russian Academy of Medical Sciences, 1999

Major Research Interests

Electromagnetic field interactions with biological systems.
Cell membrane organization and intercellular communication.
Organization of cerebral systems and cerebral cellular mechanisms.
Computer applications in medical imaging, physiological data analysis, and in models of brain systems.
Bioinstrumentation and bioengineering.
Aerospace medicine and physiology.

Research and Professional Experience

Chief of Research Service, Loma Linda VA Medical Center, 1977-1997.
Distinguished Professor of Physiology, Loma Linda University, School of Medicine, Loma Linda CA, 1987-present.

Project Leader, US/USSR Exchange Program (Nixon-Brezhnev Agreement administered by US Department of State) Medical Hazards of Microwave Exposure, 1976-1989.
Professor of Anatomy and Physiology, UCLA School of Medicine, 1957-1977.
Director, Laboratory of Environmental Neurobiology, UCLA Brain Research Institute, 1974-1977.
Director, Space Biology Laboratory, UCLA Brain Research Institute, 1961-1974.
Licensed Medical Practitioner, State of California, 1979-present.
Principal investigator, NASA Long Duration Biosatellite Experiment (Biosatellite III), 1963-1970.
Senior Lecturer in Anatomy, University of Melbourne, Australia 1955-1956.
Assistant Professor of Anatomy, UCLA School of Medicine, 1954.
Licensed Medical Practitioner, State of Victoria, Australia, 1955-present.
Lecturer, Senior Lecturer and Reader in Anatomy, University of Adelaide, Australia, 1946-1953.
Nuffield Foundation Dominion Fellow, University of Oxford, 1950-1951.
Surgeon Lieutenant, Royal Australian Navy, 1945-1946.
Resident Medical Officer, Royal Adelaide Hospital, Adelaide, Australia, 1944.

Publications

Over 400 papers, chapters, and books on cell and molecular biology, physiological and bioengineering research.

Consultant Activities

Chairman, Committee on Extremely Low Frequency Electromagnetic Fields, National Council on Radiation Protection and Measurement, 1986-present.
Member, Microwave Effects Panel, National Council for Radiation Protection, 1977-1982.
Member, Assembly of Life Sciences, National Academy of Sciences, 1976-1981.
Associate, Neuroscience research Program, Massachusetts Institute of Technology, 1964-1977.
Member, Space Sciences Panel, President's Scientific Advisory Committee, The White House, 1966-1971.
Member, Biology and Medicine Panel, President's Science Advisory Committee, The White House, 1969-1971.
Member, Electromagnetic Radiation Management Advisory council, Executive Office of the President, 1969-1979; Department of Commerce, 1979-1982.
Member, Telecommunications Panel, National Academy of Engineering, 1972-1974.
Elected U.S. Delegate, commission A on Radio Standards and Measurements, International Union of Radio Sciences (URSI), 1975-present.
Member, National Academy of Sciences Panel on Biosphere Effects of Extremely Low Frequency Radiation, 1976.
Consultant, National Institute of Health.
Consultant, National Aeronautics and Space Administration.
Consultant, Department of Energy.
Consultant, Veterans Administration.

Editorial Service**Science****Electroencephalography and Clinical Neurophysiology****Perspectives in the Brain Sciences****Brain Research****Neuroscience Research****Computer Programs in Biomedicine****Mathematical Biosciences****Journal of Neurological Research****Bioelectromagnetics****Carcinogenesis****Consultant, World Health Organization (WHO), Geneva, Safety Standards Committee for ELF Fields.****Professional Societies****American Academy of Arts and Sciences****American Physiological Society****American Association of Anatomists****Anatomical Society of Great Britain and Ireland****Institute of Electrical and Electronics Engineers****American Electroencephalographic Society****Aerospace Medical Association****American Association for the Advancement of Science****Royal Society of Medicine, London****American Association of Neurological Surgeons****Biomedical Engineering society****Alpha Omega Alpha Honor Medical Society****Hobbies****Amateur radio, radioastronomy, photography, marathon running, skiing, and backpacking.**

W.R. ADEY

SUMMARY OF RESEARCH ACTIVITIES

Initial basic research activities centered on experimental anatomy in studies of structure and pathways relating limbic lobe to the diencephalon. This work at the University of Oxford and University of Adelaide from 1946 to 1953 investigated the structural basis for participation of the temporal lobe of the brain in attentive behavior and learning processes. In the same period, an increasing interest in electrophysiology led to design and construction of the first electroencephalographic recording amplifiers built in Australia, and construction of ancillary equipment, including stimulus pulse generators and cathode ray recording cameras. Clinical studies of temporal lobe functions were also carried out in Adelaide and Melbourne, Australia, between 1953 and 1957.

Following his appointment to the University of California, Los Angeles, in 1957, his most active research has been in learning and memory mechanisms, by techniques which he developed for recording brain electrical activity in freely performing animals and man. He has pioneered electrode techniques, radiotelemetry methods, and magnetic tape recording systems for biomedical data acquisition, in a variety of bioengineering and bioinstrumentation programs. These methods were used to compile the first "library" of normal brain wave data in performing man.

By extensive use of digital computing techniques, including the first application of a general-purpose digital computer to time-series analysis of brain wave data, new knowledge has been gained on the patterns of electric waves accompanying learned behavior. These techniques have involved pattern-recognition methods in characterizing correct and incorrect performances.

His studies in environmental physiology have included research on the effects of the space environment on brain functions in man and monkey. They have shown fragmentation of states of sleep and wakefulness, modified circadian rhythms, and altered fluid balance in the weightless state. He has developed a series of radio biotelemetry systems, and new methods in underwater biotelemetry.

He has combined electron microscopy of cerebral ultrastructure with new electrophysiological techniques of impedance recording to evaluate the role of macromolecules and surfaces of nerve cells in learning and memory. This work has provided insight on stored information in brain tissue, and emphasizes the role of the surface of brain cells as potential storage sites.

He has shown a sensitivity of brain tissue to weak intrinsic and environmental electric fields, with behavioral, neurophysiological and biochemical effects induced by electric gradients orders of magnitude below those associated with classical synaptic excitation. These new models of cerebral neuronal membrane organization envisage processes of membrane amplification, based on "cooperative" interactions between cell surface glycoproteins and divalent cations, particularly calcium.

He has pioneered new concepts in transductive coupling of signals across cell membranes, involving the detection of hormonal, immune and neurotransmitter stimuli at cell membrane surfaces and transmission of signals to the cell interior. This work has required novel applications of electromagnetic fields as tools in the study of these essential functions of cell membranes. These studies have shown three essential stages in signaling across cell membranes. They are characterized by nonlinear, nonequilibrium processes. These models differ substantially from traditional equilibrium concepts of membrane excitation. Imposed electromagnetic fields have revealed sensitivities in initial transductive events orders of magnitude higher than reported with traditional stimulation techniques. Signals crossing the

lipid bilayer may be carried as solitary waves or solitons on helical protein molecules. The findings are of general significance in all areas of cell biology, and have close relevance to problems of brain function, aging and cancer.

He collaborated in the first meteor doppler radar studies in Australia, and in infrared planetary scanning studies with colleagues at the California Institute of Technology, using the 200 inch telescope at Mt. Palomar. As a hobby interest, he has made moon radar studies.

CURRICULUM VITAE

Name: Joe Allen Elder

Present Position: Special Assistant

Office of the Associate Director for Health
National Health and Environmental Effects Research Laboratory
U.S. Environmental Protection Agency
Research Triangle Park, NC 27711
Telephone: (919) 541-2542

Education:

B.S.	Berry College (Highest honors)	1963	Physics/Math, Chemistry Minor
M.S.	Vanderbilt University (AEC Health Physics Fellowship, 1963-64)	1965	Physics
Ph.D.	Pennsylvania State University	1970	Biophysics
Post- Ph.D.	Johns Hopkins School of Medicine (Post-doctoral Fellow with Dr. A.L. Lehninger)	1970-73	Physiological Chemistry

Employment/Positions:

1973 to present	U.S. Environmental Protection Agency National Health and Environmental Effects Research Laboratory Research Triangle Park, NC 27711
3/73 to 12/73	Cellular biologist, Molecular Biology Branch Experimental Biology Division (EBD)
1/74 to 4/74	Acting Chief, Molecular Biology Branch, EBD
4/74 to 4/76	Chief, Molecular Pathology Section, EBD
4/76 to 9/79	Chief, Neurobiology Branch, EBD
9/79 to 1/82	Chief, Cellular Biophysics Branch, EBD
1/82 to 12/84	Acting Director, Experimental Biology Division
12/84 to 2/87	Chief, Cellular Biophysics Branch, EBD
3/87 to 12/88	Chief, Cell Biology Branch
1/89 to 3/90	Acting Director, Research and Regulatory Support Division
4/90 to present	Special Assistant Office of the Associate Director for Health National Health and Environmental Effects Research Laboratory

BOOK CHAPTERS/REPORTS

Elder, J.A. Thermal, Cumulative, and Life Span Effects and Cancer in Mammals Exposed to Radiofrequency Radiation. In: Biological Effects of Electric and Magnetic Fields, D.O. Carpenter and S. Ayrapetyan, editors. Academic Press, San Diego, Volume 2, pp. 279-295, 1994.

Elder, J.A. Electric and Magnetic Fields: An EPA Perspective on Research Needs and Priorities for Improving Health Risk Assessment (EPA/600/9-91/016F). December 1992. 60 pages.

Elder, J.A., Czernski, P., Stuchly, M.A., Mild, K.H. and Sheppard, A.R. Radiofrequency Radiation. In: Nonionizing Radiation Protection (M.J. Suess, editor), WHO Regional Publications, European Series No. 10, Copenhagen, Chapter 4, pp. 117- 173, 1989.

Elder, J.A. Radiofrequency Radiation: Activities and Issues. In: Biological Effects of Electropollution: Brain Tumors and Experimental Methods, (S.K. Dutta and R.M. Millis), Information Ventures, Inc., Chapter 1, pp. 1-8, 1986.

Elder, J.A. and Cahill, D.F. (Editors). Biological Effects of Radiofrequency Radiation (EPA-600/8-83-026F). 1984. 268 pages. National Technical Information Services (NTIS) No. PB-85-120848.

Elder, J.A. Research needs for establishing an environmental microwave radiation safety standard. In: Human Health and the Environment - Some Research Needs, Report of the Second Task Force for Research Planning in Environmental Health Science, DHEW Publication No. NIH 77-1277, pp. 137-142, 1977.

Elder, J.A. Biological effects of nonionizing radiation. Proceedings of the Second Joint US/USSR Symposium on the Comprehensive Analysis of the Environment, Honolulu, Hawaii, October 21-26, 1975, pp. 68-74, (EPA 600/9-76-024, NTIS No. PB 259-520/AS), 1976.

PUBLICATIONS

Blackman, C.F., J.P. Blanchard, S.G. Benane, D.E. House and J.A. Elder. A double blind test of magnetic field effects on neurite outgrowth. Bioelectromagnetics 19: 204-209, 1998.

Elder, J.A. A reassessment of the biological effects of radiofrequency radiation: non-cancer effects. A report to the Office of Radiation Programs, U.S. EPA, July 12, 1987. In: Summary and Results of the April 26-27, 1993 Radiofrequency Radiation Conference. Volume 1: Analysis of Panel Discussions (EPA 402-R-95-009). Appendix A, pp. A-1 to A-12. March 1995.

Elder, J.A. Responses of laboratory mammals to radiofrequency radiation (500 kHz -100 GHz). In: Summary and Results of the April 26-27, 1993 Radiofrequency Radiation Conference. Volume 2: Papers (EPA 402-R-95-011), March 1995, pp. 87-100.

MacPhail, R.C., Berman, E., Elder, J.A., Kavlock, R.J., Moser, V.C., Narotsky, M.G. and Schlicht, M. A multidisciplinary approach to toxicological screening:

IV. Comparison of results. *J. Toxicology and Environmental Health* 45: 211-220, 1995.

Elder, J.A. Radiofrequency radiation activities and issues: A 1986 perspective. *Health Physics* 53:607-611, 1987.

Ward, T.R., Elder, J.A., Long, M.D. and Svendsgaard, D. Measurement of blood-brain barrier permeation in rats during exposure to microwaves (2450 MHz). *Bioelectromagnetics* 3(3): 371-383, 1982.

Smialowicz, R.J., Weil, C.M., Kinn, J.B. and Elder, J.A. Exposure of rats to 425-MHz (CW) radiofrequency radiation: Effects on lymphocytes. *J. Microwave Power* 17: 211-221, 1982.

Blackman, C.F., Joines, W.T. and Elder, J.A. Calcium-ion efflux induction in brain tissue by radiofrequency radiation. In: Biological Effects of Nonionizing Radiation, K. Illinger, editor, ACS Symposium Series Proceedings, Vol. 157, Ch. 17, pp. 299- 314, 1 981.

Blackman, C.F., Benane, S.G., Elder, J.A., House, D.E., Lampe, J.A. and Faulk, J.M. Induction of calcium-ion efflux from brain tissue by radiofrequency radiation: Effect of sample number and modulation frequency on the power-density window. *Bioelectromagnetics* 1: 35-43, 1980.

Blackman, C.F., Elder, J.A., Weil, C.M., Benane, S.G., Eichinger, D.C. and House, D.E. Induction of calcium-ion efflux from brain tissue by radiofrequency radiation: Effects of modulation-frequency and field strength. *Radio Science* 14(6S), 93-98, 1979.

Smialowicz, R.J., Kinn, J.B. and Elder, J.A. Perinatal exposure of rats to 2450 MHz CW microwave radiation: Effects of lymphocytes. *Radio Science* 14(6S), 147-153, 1979.

McRee, D.I., Elder, J.A., Gage, M.I., Reiter, L.W., Rosenstein, L.S., Shore, M.L., Galloway, W.D., Adey, W.R. and Guy, A.W. Effects of nonionizing radiation on the central nervous system, behavior and blood. A progress report. *Environmental Health Perspectives* 30: 123-131, 1979.

Huang, A.T., Engle, M.E., Elder, J.A., Kinn, J.B. and Ward, T.R. The effect of microwave radiation (2450 MHz) on the morphology and chromosomes of lymphocytes. *Radio Science* 12(6S): 173-177, 1977.

Elder, J.A., Ali, J.S., Long, M.D. and Anderson, G.E. A coaxial air line microwave exposure system: Respiratory activity of mitochondria irradiated at 2-4 GHz. In: Biological Effects of Electromagnetic Waves, Selected Papers of the USNC/URSI Annual Meeting, Boulder, Colorado, Oct. 20-23, 1975; C.C. Johnson and M.L. Shore, editors, Vol. 1:352-365, HEW Publication (FDA) 77-8010, 1976.

Elder, J.A. and Ali, J.S. The effects of microwaves (2450 MHz) on isolated rat liver mitochondria. *Annals of the New York Academy of Sciences* 247: 251-262, 1975.

Ward, T.R., Allis, J.W. and Elder, J.A. Measure of enzymatic activity coincident with 2450 MHz microwave exposure. *J. Microwave Power* 10(3): 315-320, 1975.

Elder, J.A. and Lehninger, A.L. Respiration-dependent transport of carbon dioxide into rat liver mitochondria. *Biochemistry* 12: 976-982, 1973.

Elder, J.A. and Lehninger, A.L. Energy-linked uptake of Ca^{2+} supported by carbon dioxide: Inhibition by diamox. In: Mechanisms in Bioenergetics, G.G. Azzone, L. Ernster, Sp. Papa, E. Quagliariello and N. Siliprandi, Editors, Academic Press, New York, 1 973, pp. 513-526.

Schraer, R., Elder, J.A. and Schraer, H. Aspects of mitochondrial function in calcium movement and calcification. *Federation Proceedings* 32: 1938-1943, 1973.

INVITED PRESENTATIONS/SEMINARS

RF Radiation. In course on the Health Effects of Electric and Magnetic Fields: An Update, Johns Hopkins School of Public Health, July 1996.

Biological Basis for Limiting Radiofrequency Exposures. In session on Radiation Health, 35th Navy Occupational Health and Preventive Medicine Workshop, March 1, 1994, Virginia Beach, VA.

An Overview of Federal EMF Activities. Advisory and Safety Committee, Eugene Electric and Water Board, April 9, 1994, Eugene, OR.

RF Radiation and Cancer: Long-Term Exposure Studies of Laboratory Animals and Human Populations. Cellular Telephone Research and Cancer Symposium, December 14, 1993, Washington, DC.

Radiofrequency Radiation Guidelines. In session on Recent Issues in Radiofrequency Health Effects, Bioelectromagnetics Society Annual Meeting, June 14, 1993, Los Angeles.

Responses of Laboratory Animals to Radiofrequency Radiation (500 kHz-100 GHz). Radiofrequency Radiation Conference, April 26-27, 1993, Bethesda, MD.

Responses of Animals to Radiofrequency Radiation (500 kHz-100 GHz). NATO Advanced Research Workshop on Developing a New Standardization Agreement for Radiofrequency Radiation, May 17-21, 1993, Rome, Italy.

Electric and Magnetic Field Issues. Oak Ridge Associated Universities, September 19, 1991, Atlanta, GA.

Biological Effects of Radiofrequency Radiation. EPA Region II Workshop on Electric and Magnetic Fields, August 15, 1991, Albany, NY.

Radiofrequency Radiation Activities and Issues. King County Council, May 23, 1991, King County, WA.

A National Research Agenda for Electric and Magnetic Fields. Annual Meeting of the Electromagnetic Energy Policy Alliance, April 24, 1991, Alexandria, VA.

A National Research Agenda for Electric and Magnetic Fields. NIOSH Scientific Workshop on the Health Effects of Electromagnetic Radiation on Workers, January 31, 1991, Cincinnati, OH.

Biological Effects of Radiofrequency Radiation. American Physical Society Special Session on Nonionizing Radiation, April 18, 1990, Washington, DC.

Biological Effects of Radiofrequency Radiation. Susquehanna Valley Chapter of the Health Physics Society, November 29, 1989, Hershey, PA.

Electromagnetic Radiation. Advisory Council of the NC Coastal Resources Commission, September 29, 1989, Wilmington, NC.

Biological Effects of Radiofrequency Radiation. North Carolina Coastal Resources Commission's Military Activities Task Force, April 27, 1989, Washington, NC.

Biological Effects of Radiofrequency Radiation. Interagency Work Group on Radiofrequency Radiation Guidance, December 7, 1987, Washington, DC.

Biological Effects of Radiofrequency Radiation. Board on Environmental Studies and Toxicology, National Academy of Sciences, 1987, Woods Hole, MA.

Update on the Biological Effects of Radiofrequency Radiation. EPA Office of Health Research seminar series, July 31, 1986, Washington, DC.

Radiofrequency Radiation Activities and Issues. Health Physics Society Annual Meeting, June 30, 1986, Pittsburgh, PA.

Radiofrequency Radiation Activities and Issues. N.C. Chapter of the Health Physics Society and American Society of Safety Engineers. January 21, 1986, Chapel Hill, NC.

Radiofrequency Radiation Activities and Issues. Howard University Symposium on Biological Effects of Electropollution, September 9, 1985, Washington, D.C.

Biological Effects of Radiofrequency Radiation. Committee on Interagency Radiation Research and Policy Coordination, Office of Science and Technology Policy, July 2, 1985, Washington, D.C.

EPA Review of Biological Effects of RF Radiation. Food and Drug Administration (FDA), Center for Devices and Radiological Health (CDRH), Public Hearing on Radiofrequency Sealers, Heaters, and Gluers, Nov. 15, 1984, Rockville, MD.

Biological Effects of Radiofrequency Radiation (0.5 MHz-100 GHz). First Annual Electromagnetic Energy Policy Alliance (EEPA) Seminar, Nov. 1, 1984, Chicago, IL.

Biological Effects of Radiofrequency Radiation. EPA Symposium on Electromagnetic Field Measurements for Hazard Assessment, Oct. 9, 1984, Las Vegas, NV.

Biological Effects of Radiofrequency Radiation (0.5 MHz-100 GHz). Institute of Electrical and Electronics Engineers (IEEE) Committee on Man and Radiation (COMAR), July 14, 1984, Atlanta, GA.

RF Radiation: An Applied Research Program. Cell and Molecular Biology Program, Pennsylvania State University, May 1984.

Health Effects of Nonionizing Radiation. Conference of Radiation Control Program Directors, Albany, NY, November 18, 1982.

RF Radiation Biological Effects Research: Areas of Concern. J.A. Elder. Seminar on RF Radiation: Legal and Policy Implications. Oct. 27-29, 1982, The Homestead, Hot Springs, VA.

Effect of Modulated Radiofrequency Radiation on Brain Tissue. J.A. Elder, Symposium on Microwaves in Biology and Medicine, American Association for the Advancement of Science (AAAS), January 7, 1980, San Francisco, CA.

An Introduction to Biological Effects of Radio Frequency Radiation. J.A. Elder. Presented at the Annual Meeting of the N.C. Chapter of the Health Physics Society, May 20-21, 1977, Research Triangle Park, NC.

Biological Effects of Non-Ionizing Radiation. J.A. Elder, Second Joint US/USSR Symposium on the Comprehensive Analysis of the Environment. Oct. 22-25, 1975, Honolulu, Hawaii.

Energy-Linked Uptake of Ca²⁺ Supported by Carbon Dioxide: Inhibition by Diamox. J.A. Elder and A.L. Lehninger, International Conference on Mechanisms in Bioenergetics, Pugnochiuso, Italy, May, 1972.

OTHER PRESENTATION

"Cataractogenic Effect of Microwave Radiation in Laboratory Animals." Testimony presented to the U.S. House of Representatives Subcommittee, May 12-13, 1981. In: "Potential Health Effects of Video Display Terminals and Radio Frequency Heaters and Sealers," U.S. Government Printing Office, 1981, pp. 137-142.

COMMITTEES/SUPPLEMENTAL ACTIVITIES

Member, WHO EMF Research Coordination Committee, Geneva, 1997 to present.

Member, FDA Technical Electronic Products Radiation Safety Standards Committee, 1996 to 1998.

Member, Peer Review Board, Harvard Center for Risk Analysis, for the Wireless Technology Research Program (formerly Cellular Telephone Research Program), 1995 to present.

Member, Interagency (EPA, FDA, NIOSH, OSHA, FCC, NTIA) Radiofrequency Radiation Work Group (Purpose: to coordinate activities of federal regulatory agencies Development of RF radiation guidelines for the public), 1994 to present.

Member, Nonionizing Committee, N.C. Radiation Protection Commission, 1979-present.

Coordinator, health testing requirements in EPA Rule "Fuels and Fuel Additives Registration Regulations; Final Rule." Federal Register, Vol. 59, No. 122, June 27, 1994, pp. 33042-33142.

EPA/ORD/NHEERL Coordinator, health effects research issues of manganese and fuel additives containing manganese. 1994 to present.

Reviewer, Radio-Frequency and Microwave Radiation, Second Edition, Nonionizing Radiation Guide Series, American Industrial Hygiene Association, 1994.

Co-organizer of EPA-sponsored Radiofrequency Radiation Conference, April 26-27, 1993, Bethesda, MD.

Chair, Animal Studies (Chronic Studies, Immunology, Ocular Effects) Panel, Radiofrequency Radiation Conference, April 26-27, 1993, Bethesda, MD.

Member, Science Review Panel. See EMP Human Health Effects Science Review Panel Proceedings (NTIS report). US Navy Conference, March 16-18, 1993. Williamsburg, VA.

EPA representative, Steering Committee (DOE, NIEHS, EPRI, NY State, EPA), Annual Review of Research on Biological Effects of Electric and Magnetic Fields. 1992 to present.

Chairman, EPA Work Group on Research Needs for Electric and Magnetic Fields, June 1990-1992. Final report: Electric and Magnetic Fields: An EPA Perspective on Research Needs and Priorities for Improving Health Risk Assessment (EPA/600/9-91/016F). December 1992. 60 pages.

Observer, Health Effects Institute Feasibility Study Committee on Electric and Magnetic Fields, June-October 1991.

Chairman, Radiation Safety Committee, EPA Environmental Research Center, Research Triangle Park, NC, 1991-present.

Council Member, National Council on Radiation Protection and Measurements (NCRP), 1983-1989.

Reviewer, National Council on Radiation Protection and Measurements (NCRP) document on "Biological Effects and Exposure Criteria for Radiofrequency Electromagnetic Fields," November 1983.

Reviewer, National Council on Radiation Protection and Measurements draft report on a Practical Guide for Determination of Human Exposure to Radiofrequency Radiation, July, 1988.

Work Group on Radiofrequency Radiation, WHO Regional Office for Europe, 1984-1987.

Board of Directors, Bioelectromagnetics Society, 1983-1986.

Membership Committee, Bioelectromagnetics Society, 1983-present.

EPA Radiofrequency Radiation Guidance Work Group, 1985-1987.

Consultant, Subcommittee on Research Needs for Nonionizing Electromagnetic Radiation Health Effects, Committee for Interagency Radiation Research and Policy Coordination, Office of Science and Technology Policy, 1986.

Subcommittee C95.4 (Safety Levels and/or Tolerance with Respect to Personnel) of

the American National Standards Institute (ANSI) Committee on Radio Frequency Radiation Hazards, Committee for Evaluations of Exposure Risk, 1984-1989.

Subcommittee C95.4 (Safety Levels and/or Tolerance with Respect to Personnel) of the American National Standards Institute (ANSI) Committee on Radio Frequency Radiation Hazards, Work Group II: Low Level Effects, 1977-1982.

Member, Extramural Review Committee, NIOSH Criteria Document on "Radiofrequency/Microwave Occupational Exposure Standard and Rationale," March 26-27, 1984.

EPA Project Leader, Topic 3.1: Biological Effects of Microwave Radiation, US/USSR Cooperative Program in Environmental Health, 1975-1985.

Member, Technical Program Committee:

International Union of Radio Science Symposium on the "Biological Effects of Electromagnetic Waves", Helsinki, Finland, 1978.

Bioelectromagnetics Symposium, Seattle, Washington, 1979.

Annual Meeting, Bioelectromagnetics Society, 1982,90,91,93,94.

Radio Frequency/Microwave Committee, Interagency Regulatory Liaison Group (IRLG), 1978-1981.

Interagency Task Force on the Biological Effects of Nonionizing Electromagnetic Radiation (BENER), 1979-1980.

Member, Working Group, that revised and updated the chapter entitled "Microwave and Radiofrequency Radiation" for the manual on nonionizing radiation developed by the European Office of the World Health Organization, 1978.

Member, ad hoc Working Group, Office of Science and Technology Policy, that prepared the report "A Technical Review of the Biological Effects of Non-ionizing Radiation," May 15, 1978.

Member, Second Task Force for Research Planning in Environmental Health Science, 1977. Author of section on "Microwave Radiation (pp. 137-142) in Chapter 5: Physical Environmental Factors in Human Health and the Environment - Some Research Needs, 1977 (DHEW Publication # NIH 77-2377).

SYMPOSIUM SESSION CHAIRMAN

Co-chair, "In Vivo (Including Melatonin) and Behavior," 13th Annual Meeting of the Bioelectromagnetics Society, Salt Lake City, UT, June 23-27, 1991.

Co-chair, "Sensory and Neurological Studies," 6th Annual Meeting of the Bioelectromagnetics Society, Atlanta, GA, July 15-19, 1984.

Co-chair, "Neurological Effects," 4th Annual Meeting of the Bioelectromagnetics Society, Los Angeles, CA, June 28-July 2, 1982.

Chairman, "Physiology," 1st Annual Meeting of the Bioelectromagnetics Society, Seattle, WA, June 18-22, 1979.

PROFESSIONAL SOCIETY

Bioelectromagnetics Society, Invited Member/Charter Member.

Nominee for President, Bioelectromagnetics Society, 1981.

Board of Directors, Bioelectromagnetics Society, 1983-86.

Member, Membership Committee, Bioelectromagnetics Society,
1983 to present.

PROJECT OFFICER

NCRP (National Council on Radiation Protection and Measurements) report on "A Practical Guide to the Determination of Human Exposure to Radiofrequency Fields." NCRP Report No. 119, 1993.

NCRP (National Council on Radiation Protection and Measurements) report on "Extremely Low Frequency Electric and Magnetic Fields." In peer review.

EPA/NIEHS Interagency Agreement on Health Research on Electric and Magnetic Fields. 1993 to present.

AWARDS

EPA Bronze Medal for Commendable Service, 1995.

Citation: For outstanding achievement in the development of an innovative health effects testing program for motor vehicle fuels and fuel additives.

EPA Bronze Medal for Commendable Service, 1993.

Citation: For superior efforts in producing the December 1992 report "Electric and Magnetic Fields: An EPA Perspective on Research Needs and Priorities for Improving Health Risk Assessment."

EPA Bronze Medal for Commendable Service, 1985.

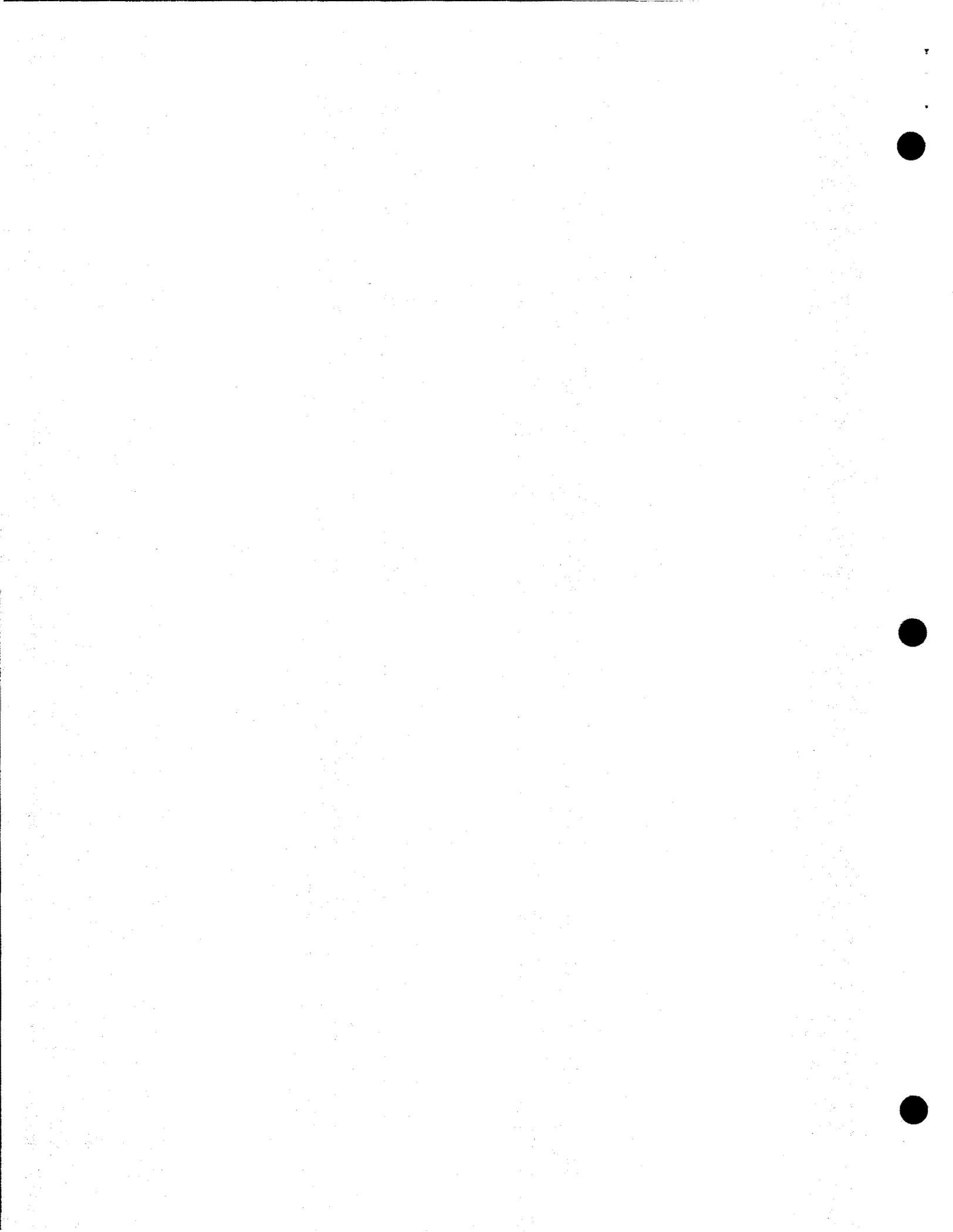
Citation: For exceptional service as Acting Director of the Experimental Biology Division, Health Effects Research Laboratory, and for contributions as principal editor of the comprehensive review document "Biological Effects of Radiofrequency Radiation."

EPA Scientific and Technological Achievement Award, Level I (Highest), 1984, for

paper on "Measurement of Blood-Brain Barrier Permeation in Rats During Exposure to 2,450-MHz Microwaves," T.R. Ward, J.A. Elder, M.D. Long, and D. Svendsgaard. Bioelectromagnetics 3:371-383, 1982.







August 1999

CURRICULUM VITAE

HENRY C. LAI, Ph.D.

Date of Birth

June 28, 1949

Citizenship

USA

Education

B.Sc. (Hon.) (Physiology, 1971) McGill University, Montreal, Quebec, Canada

Ph.D. (Psychology, 1977) University of Washington, Seattle, WA, USA

Postgraduate Training

Postdoctoral Fellow, Department of Pharmacology, University of Washington, 1978-1980.

Faculty Positions

Research Associate, Department of Pharmacology, University of Washington, 1980-1983.

Research Assistant Professor, Department of Pharmacology, University of Washington, 1984-1989.

Adjunct Research Assistant Professor, Center for Bioengineering, University of Washington, 1988.

Research Associate Professor, Department of Pharmacology, University of Washington, 1989-1995.

Adjunct Research Associate Professor, Center for Bioengineering, University of Washington, 1989-1995.

Research Associate Professor, Center for Bioengineering, University of Washington, 1995-1997.

Research Professor, Department of Bioengineering, University of Washington, 1997-present.

Teaching Responsibilities

Pharmacology 512, lectures on central dopamine and cholinergic systems, 1986-1996

Pharmacology 435, neuropsychopharmacology for dental students, 1989-1996

Consulting and Public Service

Member, Small Grant Review Committee, Alcoholism and Drug Abuse Institute, University of Washington (1984-1986)

Member, American National Standard Institute, C95 Working Group on Non-ionizing Radiation Hazards (1987-present)

Member, Consultant Team on Environmental Study of Telecommunication Facilities for the Office for Long-Range Planning, City of Seattle (1987)

Out-of-State grant reviewer, Louisiana Education Quality Support Fund of the Louisiana State Board of Regents (1987)

Member, USA-USSR Exchange Program on Study of the Biological Effects of Physical Factors in the Environment, US Food and Drug Administration and USSR Ministry of Health (1987-1991)

Grant review for the Air Force Office of Scientific Research (1990)

Ad hoc reviewer, Minority Biomedical Research Support Program, National Institute of General Medical Sciences, NIH (1994)

Scientific consultant, Wireless Technology Research, Washington, DC (1994)

Member, Radiation Study Section (Special Emphasis Panel), National Institutes of Health (1995)

Member, Commission K (Electromagnetics in Biology and Medicine) of the United States National Committee for the International Union of Radio Science (URSI) (1995-present)

Member, Board of Directors, Bioelectromagnetics Society (1996-1999)

Member, panel to investigate the possible health effects of the PAVE PAW radar in Cape Cod, Department of Public Health, the Commonwealth of Massachusetts

Patent

Methods of Inhibition or Killing Cancer Cells Using an Endoperoxide (U.S. patent No. 08/434,452), issued 11/26/96; international patent pending.

Research Funding

Office of Naval Research (Contract N0014-80-C-0354)
Neurophysiological and Behavioral Effects of Microwave Exposure
H. Lai, P.I.
6/1/85-5/31/87

\$190,000

NIA (1PG0 A G05136-01A1)
Animal Model for Alzheimer's Disease-Feasibility Study
A. Horita, P.I., H. Lai, Co-P.I.
7/1/85-6/30/86
\$44,870

NIEHS (ES-03712)
Neural Effects of Low-Level Microwaves
A.W. Guy, P.I., H. Lai, Co-P.I.
1/1/85—12/31/87
\$290,708

NIEHS (ES-03712)
Neural Effects of Low-level Microwaves
H. Lai, P.I.
1/1/88—12/31/91
\$563,439

NIEHS (RO1 ES-03712)
Neural Effects of Low-Level Microwaves
H. Lai, P.I.
8/1/92—7/31/97
\$679,354

NIEHS (RO1 ES-06290)
Effects of 60-Hz Magnetic Field on Cholinergic Systems
H. Lai, P.I.
9/28/94-2/28/99
\$493,207

NIEHS (RO3 ES-08865)
60 Hz magnetic field-induced DNA damage
H. Lai, P.I.
2/1/97-12/31/99
\$98,792

The Fetzer Institute
Treatment of malaria using oscillating magnetic fields
H. Lai, P.I.
1998
\$15,000

Wireless Technology Research, L.L.C.
In vivo effect of cellular phone radiation
H. Lai, P.I.
March -August, 1998
\$ 83,200

EMX Incorporation
H. Lai, P.I.
\$80,000

Bibliography

Publications in Refereed Journals

1. Sweeney, G.D., Janigan, D., Mayman, D. and Lai, H. The experimental porphyrias: a group of distinctive metabolic lesions. In: *"The Proceedings of International Conference on Porphyrin Metabolism and Porphyria"*. South African Journal of Laboratory and Clinical Medicine, South African Medical Journal, Sept. 25, 1971, pp. 68-72.
2. Sweeney, G.D., Freeman, F.B., Rothwell, D. and Lai, H. Decreases in hepatic cytochrome P-450 and catalase following allylisopropylacetamide: the effect of concomitant hemin administration. Biochem. Biophys. Res. Comm. 47:1366-1374, 1972.
3. Horita, A., Carino, M.A. and Lai, H. Influence of catecholamine antagonists and depletors on the CNS effects of TRH in rabbit. Prog. Neuro-Psychopharmacol. 1:107-112, 1977.
4. Lai, H., Quock, R.M., Makous, W.L., Horita, A. and Jen, L.S. Effects of methylazoxymethanol acetate on brain biogenic amines and behavior of the rat. Pharmacol. Biochem. Behav. 8:251-257, 1978.
5. Lai, H., Makous, W.L., Quock, R.M. and Horita, A. Visual deprivation affects serotonin levels in the visual system. J. Neurochem. 30:1187-1189, 1978.
6. Lai, H., Makous, W.L., Horita, A. and Leung, H. Effects of ethanol on turnover and function of striatal dopamine. Psychopharmacology 61:1-9, 1979.
7. Lai, H., Carino, M.A., Sperry, R. and Horita, A. Effects of thioridazine on apomorphine elicited stereotypic behavior and motor activity. Pharmacol. Biochem. Behav. 13:397-401, 1980.
8. Lai, H., Carino, M.A. and Horita, A. Effects of ethanol on central dopamine functions. Life Sci. 29:299-304, 1980.
9. Lai, H., Carino, M.A., Sperry, R. and Horita, A. Effects of microinjection of 2-chloro-11-(2-dimethylaminoethoxy)-dibenzo[b,f] thiepine (zotepine), thioridazine, and haloperidol into the striatum and nucleus accumbens on stereotypic behavior and motor activity. J. Pharm. Pharmacol. 33:252-254, 1981.
10. Lai, H., Carino, M.A. and Horita, A. Chronic treatments with zotepine, thioridazine, and haloperidol affect apomorphine-elicited stereotypic behavior and striatal ³H-spiroperidol binding sites in the rat. Psychopharmacology 75:388-390, 1981.
11. Lai, H., Kazi, M.S., Carino, M.A. and Horita, A. Chronic haloperidol treatment potentiates apomorphine- and ethanol-induced hypothermia in the rat. Life Sci. 30:821-826, 1982.
12. Lai, H., Horita, A., Chou, C.K. and Guy, A.W. Psychoactive drug response is affected by acute low-level microwave irradiation. Bioelectromagnetics 4:204-214,

1983.

13. Yamawaki, S., Lai, H. and Horita, A. Effects of apomorphine on body temperature: involvement of dopamine and serotonin mechanisms. J. Pharmacol. Exp. Ther. 227:383-388, 1983.
14. Lai, H. and Horita, A. Apomorphine-induced hypothermia affected by acute treatment with apomorphine, haloperidol, and ethanol. Psychopharmacology 82:335-337, 1984.
15. Yamawaki, S., Lai, H. and Horita, A. Ethanol induced hypothermia: effects of dopaminergic and serotonergic drugs. Life Sci. 34:467-474, 1984.
16. Lai, H., Horita, A., Chou, C.K. and Guy, A.W. Acute low-level microwave irradiation and the actions of pentobarbital: effects of exposure orientation. Bioelectromagnetics 5:203-212, 1984.
17. Lai, H., Horita, A., Chou, C.K. and Guy, A.W. Low-level microwave irradiation affects ethanol-induced hypothermia and ethanol consumption. Bioelectromagnetics 5:213-220, 1984.
18. Lai, H., Horita, A., Chou, C.K. and Guy, A.W. Microwave-induced postexposure hyperthermia: involvement of endogenous opioids and serotonin. IEEE Tran. Microwave Theory Tech. MTT-32:882-887, 1984.
19. Pae, Y.S., Lai, H. and Horita, A. Effects of acute treatments with apomorphine, haloperidol, and ethanol on apomorphine-induced changes in body temperature. Neuropharmacol. 23:1109-1112, 1984.
20. Pae, Y.S., Lai, H. and Horita, A. Hyperthermia in the rat from handling stress blocked by naltrexone injected into the preoptic anterior hypothalamus. Pharmacol. Biochem. Behav. 22:337-339, 1985.
21. Chou, C.K., Guy, A.W., McDougall, J. and Lai, H. Specific absorption rate in rats exposed to 2450-MHz microwaves under seven exposure conditions. Bioelectromagnetics 6:73-88, 1985.
22. Fatherazi, S., Lai, H., Kazi, M.S. and Horita, A. Intraseptal morphine potentiates pentobarbital narcosis and hypothermia in the rat. Pharmacol. Biochem. Behav. 23:505-507, 1985.
23. Zucker, J.R., Lai, H. and Horita, A. Intraseptal microinjections of substance P and analogues potentiate pentobarbital-induced narcosis and depression of hippocampal cholinergic activity. J. Pharmacol. Exp. Ther. 235:398-407, 1985.
24. Lai, H., Horita, A., Chou, C.K. and Guy, A.W. Low-level microwave irradiation attenuates naloxone-induced withdrawal syndrome in morphine-dependent rats. Pharmacol. Biochem. Behav. 24:151-153, 1986.
25. Liles, W.C., Taylor, S., Finnell, R., Lai, H. and Nathanson, N.M. Decreased muscarinic acetylcholine receptor number in the central nervous system of the tottering (tg/tg) mouse. J. Neurochem. 46:977-982, 1986.
26. Lai, H., Zabawska, J. and Horita, A. Sodium-dependent high-affinity choline

- uptake in hippocampus and frontal cortex of the rat affected by acute restraint stress. Brain Research 372:366-369, 1986.
27. Lai, H., Horita, A., Chou, C.K. and Guy, A.W. Effects of low-level microwave irradiation on amphetamine hyperthermia are blocked by naloxone and classically conditionable. Psychopharmacology 88:354-361, 1986.
 28. Lai, H., Horita, A., Chou, C.K. and Guy, A.W. A review of microwave irradiation and actions of psychoactive drugs. IEEE Engin. Med. Biol. 6(1):31-36, 1987.
 29. Lai, H., Bowden, D.M. and Horita, A. Age-related decreases in dopamine receptors in the caudate nucleus and putamen of the rhesus monkey (Macaca mulatta). Neurobiol. Aging 8:45-49, 1987.
 30. Lai, H., Horita, A., Chou, C.K. and Guy, A.W. Low-level microwave irradiation affects central cholinergic activity in the rat. J. Neurochem. 48:40-45, 1987.
 31. Lai, H., Horita, A., Chou, C.K. and Guy, A.W. Effects of low-level microwave irradiation on hippocampal and frontal cortical choline uptake are classically conditionable. Pharmacol. Biochem. Behav. 27:635-639, 1987.
 32. Zabawska, J., Lai, H. and Horita, A. Neural mechanisms mediating the hyperthermia elicited by prostaglandin E₂ injected into the preoptic-anterior hypothalamus. Europ. J. Pharmacol. 142:9-16, 1987.
 33. Lai, H. Acute exposure to noise affects sodium-dependent high-affinity choline uptake in the central nervous system of the rat. Pharmacol. Biochem. Behav. 28:147-151, 1987.
 34. Zucker, J.R., Calkins, D., Zabawska, J., Lai, H. and Horita, A. Effects of intraseptal drug administration on pentobarbital-induced narcosis and hippocampal choline uptake. Pharmacol. Biochem. Behav. 28:433-436, 1987.
 35. Lai, H. Effects of repeated exposure to white noise on central cholinergic activity in the rat. Brain Research 442:403-406, 1988.
 36. Lai, H., Horita, A. and Guy, A.W. Acute low-level microwave exposure and central cholinergic activity: studies on irradiation parameters. Bioelectromagnetics 9:355-362, 1988.
 37. Lai, H., Carino, M.A., Horita, A. and Guy, A.W. Acute low-level microwave exposure and central cholinergic activity: a dose-response study. Bioelectromagnetics 10:203-209, 1989.
 38. Horita, A., Carino, M.A., Zabawska, J. and Lai, H. TRH analog, MK-771, reverses neurochemical and learning deficits in medial septal lesioned rats. Peptides 10:121-124, 1989.
 39. Lai, H., Carino, M.A., Horita, A. and Guy, A.W. Low-level microwave irradiation and central cholinergic systems. Pharmacol. Biochem. Behav. 33:131-138, 1989.
 40. Lai, H., Carino, M.A. and Wen, Y.F. Repeated noise exposure affects muscarinic

cholinergic receptors in the rat brain. Brain Research 488:361-364, 1989.

41. Clarren, S.K., Astley, S.J., Bowden, D.M., Lai, H., Milam, A.N., Rudeen, K. and Shoemaker, W. Neuroanatomic and neurochemical abnormalities in nonhuman primate infants exposed to weekly doses of ethanol during gestation. Alcoholism: Clinical & Expt. Res. 14:674-683, 1990.
42. Lai, H. and Carino, M.A. Acute white noise exposure affects the concentration of benzodiazepine receptors in the brain of the rat. Pharmacol. Biochem. Behav. 36:985-987, 1990.
43. Lai, H. and Carino, M.A. Effects of noise on high-affinity choline uptake in the frontal cortex and hippocampus of the rat are blocked by intracerebroventricular injection of a corticotropin-releasing factor antagonist. Brain Res. 527:354-358, 1990.
44. Lai, H., Carino, M.A., Horita, A. and Guy, A.W. Corticotropin-releasing factor antagonist blocks microwave-induced changes in central cholinergic activity in the rat. Brain Res. Bull. 25:609-612, 1990.
45. Lai, H., Carino, M.A., Wen, Y.F., Horita, A. and Guy, A.W. Naltrexone pretreatment blocks microwave-induced changes in central cholinergic receptors. Bioelectromagnetics 12:27-33, 1991.
46. Lai, H., Carino, M.A., Horita, A. and Guy, A.W. Single vs. repeated microwave exposure: effects on benzodiazepine receptors in the brain of the rat. Bioelectromagnetics 13:57-66, 1992.
47. Lai, H., Carino, M.A., Horita, A. and Guy, A.W. Opioid receptor subtypes that mediate a microwave-induced decrease in central cholinergic activity in the rat. Bioelectromagnetics 13:237-246, 1992.
48. Lai, H. and Carino, M.A. Opioid receptor subtypes mediating the noise-induced decreases in high-affinity choline uptake in the rat brain. Pharmacol. Biochem. Behav. 42:553-558, 1992.
49. Lai, H., Horita, A. and Guy, A.W. Effects of a 60-Hz magnetic field on central cholinergic systems of the rat. Bioelectromagnetics 14:5-15, 1993.
50. Khan, A., Mirolo, M.H., Lai, H., Claypoole, K., Bierut, L., Malik, R. and Bhang, J. ECT and TRH: cholinergic involvement in a cognitive deficit state. Psychopharmacol. Bull. 29:345-352, 1993.
51. Khan, A., Lai, H., Ukai, Y. and Mirolo, M.H. NS-3, a TRH-analog, reverses repeated ECS-induced deficits in water-maze performance in the rat. Pharmacol. Biochem. Behav. 47:477-481, 1994.
52. Lai, H., Horita, A. and Guy, A.W. Microwave irradiation affects radial-arm maze performance in the rat. Bioelectromagnetics 15:95-104, 1994.
53. Lai, H. and Singh, N.P. Acute low-intensity microwave exposure increases DNA single-strand breaks in rat brain cells. Bioelectromagnetics 16:207-210, 1995.
54. Lai, H. and Singh, N.P. Selective cancer cell cytotoxicity from exposure to

- dihydroartemisinin and holotransferrin. Cancer Letters 91:41-46, 1995.
55. Khan, A., Lai, H., Nishimura, Y., Mirolo, M.H. and Singh, N.P. Effects of ECS on DNA single-strand breaks in rat brain cells. Convulsive Ther. 11:114-121, 1995.
 56. Moore, J.C., Lai, H., Li, J.R., Ren, R.L., McDougall, J.A., Singh, N.P. and Chou, C.K. Oral administrations of dihydroartemisinin and ferrous sulfate retarded growth of implanted fibrosarcoma in the rat. Cancer Letters 98:83-87, 1995.
 57. Singh, N.P., Lai, H. and Khan, A. Ethanol-induced DNA single-strand breaks in rat brain cells. Mutation Research 345:191-196, 1995.
 58. Lai, H., Carino, M.A., Horita, A. and Guy, A.W. Intraseptal β -funtrexamine injection blocked microwave-induced decrease in hippocampal cholinergic activity in the rat. Pharmacol. Biochem. Behav. 53:613-616, 1996.
 59. Lai, H. and Singh, N.P. DNA Single- and double-strand DNA breaks in rat brain cells after acute exposure to low-level radiofrequency electromagnetic radiation. Int. J. Radiat. Biol. 69:513-521, 1996.
 60. Lai, H. Spatial learning deficit in the rat after exposure to a 60 Hz magnetic field. Bioelectromagnetics 17:494-496, 1996.
 61. Lai, H. and Singh, N.P. Acute exposure to a 60-Hz magnetic field increases DNA strand breaks in rat brain cells. Bioelectromagnetics 18:156-165, 1997.
 62. Lai, H. and Singh, N.P. Melatonin and N-tert-butyl- α -phenylnitron blocked 60-Hz magnetic field-induced DNA single and double strand breaks in rat brain cells. J. Pineal Res. 22:152-162, 1997.
 63. Lai, H. and Singh, N.P. Melatonin and a spin-trap compound blocked radiofrequency radiation-induced DNA strand breaks in rat brain cells. Bioelectromagnetics 18:446-454, 1997.
 64. Lai, H., Carino, M.A., and Singh, N.P. Naltrexone blocked RFR-induced DNA double strand breaks in rat brain cells. Wireless Networks Journal 3:471-476, 1997.
 65. Lai, H., Carino, M.A. and Ushijima, I. Acute exposure to a 60 Hz magnetic field affects rats' performance in the water maze. Bioelectromagnetics 19:117-122, 1998.
 66. Singh, N.P. and Lai, H. 60 Hz magnetic field exposure induces DNA crosslinks in rat brain cells. Mutation Research 400:313-320, 1998.
 67. Lai, H. and Carino, M.A. Intracerebroventricular injections of mu and delta-opiate receptor antagonists block 60-Hz magnetic field-induced decreases in cholinergic activity in the frontal cortex and hippocampus of the rat. Bioelectromagnetics 19:433-437, 1998.
 68. Lai, H. and Carino, M.A. 60 Hz magnetic field and central cholinergic activity: effects of exposure intensity and duration. Bioelectromagnetics (In press)

69. Wang, B.M. and Lai, H. Acute exposure to pulsed 2450-MHz microwaves affects water maze learning in the rat. Bioelectromagnetics (In press)
70. Singh, N.P., Stephens, R.E., Singh, H. and Lai, H. Visual quantification of DNA double-strand breaks in bacteria. Mutation Research (In press)

Book Chapters

1. Lai, H. Neurological effects of microwave irradiation. In: "*Advances in Electromagnetic Fields in Living Systems, Vol. 1*", J.C. Lin (ed.), Plenum Press, New York, 1994, pp. 27-80.
2. Chandos, B., Khan, A., Lai, H. and Lin, J. C. The application of electromagnetic energy for the treatment of neurological and psychiatric diseases. In: "*Biological Effects of Magnetic and Electromagnetic Fields*", E. Ueno (ed.) Plenum Press, New York., 1996, pp. 161-169.

Manuscript submitted

1. Singh, N.P. and Lai, H. DNA crosslinks in rat brain cells after exposure to a pulsed 2450 MHz radiofrequency radiation. (Submitted to Mutation Research, April 1999).

Other Publications

1. Horita, A., Carino, M.A., Lai, H. and Lahann, T. Behavioral and autonomic effects of TRH in animals. In: "*Central Nervous System Effects of Hypothalamic and Other Peptides*", Collu et al. (eds.), Raven Press, New York, pp. 65-74, 1979.
2. Lai, H., Carino, M.A. and Horita, A. Antiserotonin properties of neuroleptic drugs. In: "*Psychopharmacology and Biochemistry of Neurotransmitter Receptors*", Yamamura et al. (eds.), Elsevier-North Holland, New York, pp. 347-353, 1980.
3. Lai, H., Horita, A., Chou, C.K. and Guy, A.W. Naloxone-blockable, classically conditionable hyperthermia in the rat after microwave exposure. In: "*Homeostasis and Thermal Stress: Experimental and Therapeutic Advances*", Cooper et al. (eds.) pp. 174-179, Karger, Basel, 1986.
4. Horita, A., Carino, M.A. and Lai, H. Pharmacology of thyrotropin releasing hormone. Ann. Rev. Pharmacol. Toxicol. 26:311-332, 1986.
5. Lai, H., Horita, A. and Guy, A.W. Effects of low-level microwaves on neurological functions. In: the "*Sixth US-USSR Workshop: Study of the Biological Effects of Physical Factors in the Environment*", J. Monahan (ed.), 1988.
6. Lee, Q.H., Guy, A.W., Lai, H. and Horita, A. Effects of 147-MHz RF fields on calcium efflux from chick brain in vitro. In: "*Sixth US-USSR Workshop: Study of the Biological Effects of Physical Factors in the Environment*", J. Monahan (ed.), 1988.

7. Lai, H. and Guy, A.W. Neurological effects of low-level microwave irradiation. In: *"Seventh US-USSR Workshop: Study of the Biological Effects of Physical Factors in the Environment,"* M. Shandala (ed.), 1990.
8. Lai, H. and Guy, A.W. Neurological effects of low-level microwave irradiation. In: *"Eighth US-USSR Workshop: Study of the Biological Effects of Physical Factors in the Environment,"* J. Monahan (ed.), 1992.
9. Lai, H. Research on the neurological effects of nonionizing radiation at the University of Washington. In: *"Past Perspectives and Future Directions on Bioelectromagnetics- the Contribution of Dr. Arthur W. Guy."* Bioelectromagnetics 13:513-526, 1992.
10. Lai, H. and Singh, N.P. Reply to comments on "Acute low-intensity microwave exposure increases DNA single-strand breaks in rat brain cells". Bioelectromagnetics 17:166, 1996.
11. Lai, H. DNA damage in EMF-exposed rat brain cells. EMF Health Report, volume 5 (number 6), November/December, 1997.
12. Feagin, J.E., Wurscher, M.A., Ramon, C. and Lai, H. Magnetic fields and malaria. In "Biologic Effects of Light: Proceedings of the Biologic Effects of Light Symposium" Holick, M.F. and Jung, E. G. (eds.) Kluwer Academic Publishers, Hingham, MA, 1999.

Abstracts

1. Lai, H. and Horita, A. Effect of intrastriatal injected thioridazine on apomorphine-elicited behavior. Abstr. Soc. Neurosci. 5:652, 1979.
2. Lai, H., Carino, M.A. and Horita, A. Effects of chronic haloperidol, thioridazine, and zotepine treatments on apomorphine elicited stereotypic behavior and ³H-spiroperidol binding sites in the striatum of the rat. Proc. West. Pharmacol. Soc. 24:5-6, 1981.
3. Lai, H., Horita, A., Carino, M.A., Chou, C.K. and Guy, A.W. Low-level microwave exposure affects the onset of action of phenobarbital in rats. Abstr. Bioelectromagnetics Soc. 3:2, 1981.
4. Lai, H., Horita, A., Chou, C.K. and Guy, A.W. Acute low-level microwave exposure affects drug actions. Abstr. Bioelectromagnetics Soc. 4:100, 1982.
5. Lai, H., Horita, A., Chou, C.K. and Guy, A.W. Acute low-level microwave irradiation affects the actions of psychoactive drugs. Abstr. Soc. Neurosci. 9:109, 1982.
6. Lai, H., Horita, A., Chou, C.K. and Guy, A.W. Conditioning of amphetamine hyperthermia with low-level microwave irradiation as the unconditioned stimulus. Abstr. Bioelectromagnetics Soc. 5:89, 1983.

7. Lai, H., Horita, A., Chou, C.K. and Guy, A.W. Low-level microwave irradiation activates endogenous opioid mechanisms in the rat. Abstr. Bioelectromagnetics Soc. 5:89, 1983.
8. Horita, A., Carino, M.A., Fatherazi, S., Lai, H. and Pae, Y.S. Naloxone and naltrexone block the gastrointestinal effects of TRH and MK-212. Proc. West. Pharmacol. Soc. 27:385-386, 1984.
9. Lai, H., Horita, A., Chou, C.K. and Guy, A.W. The pharmacology of postexposure hyperthermic response to acute exposure to 2450-MHz pulsed microwaves. Abstr. Bioelectromagnetics Soc. 6:31, 1984.
10. Lai, H., Horita, A., Chou, C.K. and Guy, A.W. Effects of acute and repeated exposure to low-level microwaves on ethanol-induced hypothermia in the rat. Abstr. Soc. Neurosci. 10:570, 1984.
11. Horita, A., Carino, M.A. and Lai, H. ACTH₁₋₂₄-induced arousal is mediated by a septohippocampal cholinergic mechanism. Fed. Proc. 44:721, 1985.
12. Lai, H., Horita, A., Chou, C.K. and Guy, A.W. Effects of low-level microwave exposure on hippocampal cholinergic functions. Abstr. Bioelectromagnetics Soc. 7:78, 1985.
13. Zucker, J., Lai, H. and Horita, A. Substance P analogue antagonists act as substance P agonist in the rat septum. Abstr. Soc. Neurosci. 11:621, 1985.
14. Lai, H., Horita, A., Chou, C.K. and Guy, A.W. Effects of low-level microwave irradiation on choline uptake in the rat are classically conditionable. Abstr. Bioelectromagnetics Soc. 8:8, 1986.
15. Zabawska, J., Lai, H. and Horita, A. Pharmacology of hyperthermia induced by injection of prostaglandin E₂ into the preoptic/anterior hypothalamus of the rat. Abstr. Soc. Neurosci. 12:235, 1986.
16. Lai, H., Zabawska, J., Chou, C.K., Horita, A. and Guy, A.W. Low-level microwave irradiation affects central cholinergic activity. Abstr. Soc. Neurosci. 12:893, 1986.
17. Swearer, E.S., Lai, H. and Horita, A. Effects of body temperature on pentobarbital-induced narcosis and depression in cholinergic activity. Abstr. Soc. Neurosci. 12:896, 1986.
18. Zucker, J., Zabawska, J., Lai, H. and Horita, A. Duration of pentobarbital anesthesia and septal hippocampal cholinergic activity. Abstr. Soc. Neurosci. 12:916, 1986.
19. Horita, A., Carino, M.A. and Lai, H. Preliminary studies on the effects of a TRH analog, MK-771, in an animal model of Alzheimer's disease. Proc. West. Pharmacol. Soc. 30:57-58, 1987.
20. Lee, Q.H., Guy, A.W., Lai, H. and Horita, A. The effects of modulated

- radiofrequency radiation on calcium efflux from chick brain in vitro. Abstr. Bioelectromagnetics Soc. 9:10, 1987.
21. Lai, H., Horita, A. and Guy, A.W. Acute microwave exposure and central cholinergic activity: parameters of radiation. Abstr. Bioelectromagnetics Soc. 9:25, 1987.
 22. Lai, H. Book review: "Endocrine and Metabolic Effects of Lithium," by J.H. Lazarus, American Scientist, September 1987.
 23. Lai, H., Horita, A. and Guy, A.W. Low-level microwave irradiation affects learning in the radial-arm maze. Abstr. Bioelectromagnetics Soc. 10:81, 1988.
 24. Lai, H., Carino, M.A., Horita, A. and Guy, A.W. Effects of repeated low-level microwave exposure on central cholinergic receptors. Abstr. Soc. Neurosci. 1988.
 25. Lai, H., Carino, M.A., Horita, A. and Guy, A.W. Naltrexone reverses the effect of repeated low-level microwave exposure on hippocampal muscarinic cholinergic receptors. Abstr. Bioelectromagnetics Soc. 11:5, 1989.
 26. Lai, H., Carino, M.A., Horita, A. and Guy, A.W. A comparison of the effects of low-level microwaves and white-noise on neurological functions in the rat. Abstr. Bioelectromagnetics Soc. 11:6, 1989.
 27. Lai, H., Horita, A. and Guy, A.W. Neurological effects of low-level microwaves are mediated by endogenous opioids. Proceedings of the Annual International Conference of the IEEE Engineering in Medicine & Biology Soc. 11:1161-1162, 1989.
 28. Lai, H., Carino, M., Horita, A. and Guy, A.W. Effects of acute and repeated microwave exposure on benzodiazepine receptors in the brain of the rat. Abstr. Bioelectromagnetics Soc. 12:41, 1990.
 29. Lai, H., Carino, M.A., Horita, A. and Guy, A.W. Opioid receptor subtypes involved in the microwave-induced changes in cholinergic activity in the rat brain. Abstr. Bioelectromagnetics Soc. 13:5, 1991.
 30. Khan, A., Lai, H., Mirolo, M.H. and Ukai, Y. ECT and TRH: cholinergic involvement in cognitive deficit states. Annual Meeting of the American College of Neuropsychopharmacology, December 1992.
 31. Lai, H., Horita, A. and Guy, A.W. Neural mechanism involved in the microwave-induced deficits in radial-arm maze performance in the rat. Abstr. Bioelectromagnetics Soc. 15:64, 1993.
 32. Singh, N.P., Malik, S., Kenny, M.A., Lai, H. and Khan, A. Acetaldehyde induced DNA single strand breaks in human lymphocytes. Society of Biological Psychiatry Annual Meeting, 1994.
 33. Khan, A., Mirolo, M.H., Claypoole, K., Lai, H. and Tucker, G. Low-dose TRH effects in ECT post-ictal state. Society of Biological Psychiatry Annual Meeting, 1994.
 34. Khan, A., Lai, H., Nishimura, Y., Mirolo, H. and Singh, N.P. ECS effects on

- neuronal DNA strand breaks. Society of Biological Psychiatry Annual Meeting, 1994.
35. Lai, H., Carino, M.A., Horita, A. and Guy, A.W. Microinjection of an opioid antagonist into the septum blocked microwave-induced decrease in hippocampal cholinergic activity in the rat. Abstr. Bioelectromagnetics Soc. 16: 1994.
 36. Ramon, C., Czapski, P., Marks, R.J. II, Lai, H.C. and Lee, S. Noninvasive biomagnetic sensing of biological current. IEEE AP-S International Symposium and UNSI Radio Science Meeting, Seattle, June 1994.
 37. Lai, H., Horita, A. and Guy, A.W. Effects of acute exposure to 60-Hz magnetic fields on spatial learning in the radial-arm maze: involvement of cholinergic systems. Abstr. Bioelectromagnetics Soc. 17: 1995.
 38. Ramon, C., Pao, I.M., Singh, N.P. and Lai, H. Electric and magnetic field profiles of video display terminals. Progress in Electromagnetics Research Symposium, Seattle, July 1995.
 39. Lai, H. and Singh, N.P. Acute exposure to a 60-Hz magnetic field increases DNA single-strand breaks in brain cells of the rat. In: the Annual Review of Research on Biological Effects of Electric and Magnetic Fields from the Generation, Delivery and Use of Electricity, Palm Springs, CA, November 12-16, 1995.
 40. Lai, H., Carino, M.A., Horita, A. and Guy, A.W. Effects of 60-Hz magnetic fields on cholinergic systems in the rat. Abstr. Bioelectromagnetics Soc. 18: 1996.
 41. Singh, N.P. and Lai, H. Use of the microgel electrophoresis assay to study DNA strand breaks after microwave exposure. 1996 Asia-Pacific Microwave Conference, New Delhi, India, Dec 17-20, 1996.
 42. Lai, H. and Singh, N.P. Melatonin blocks microwave-induced DNA strand breaks in rat brain cells. Progress in Electromagnetics Research Symposium, Hong Kong, January 6-9, 1997.
 43. Lai, H., Carino, M.A. and Singh, N.P. Magnetic field-induced DNA damage in rat brain cells are blocked by the vitamin E analog Trolox and an iron chelator. In: the Annual Review of Research on Biological Effects of Electric and Magnetic Fields from the Generation, Delivery and Use of Electricity, San Diego, CA, November 9-13, 1997.
 44. Singh, N.P. and Lai, H. 60 Hz magnetic field exposure induces DNA crosslinks in rat brain cells. Environmental Mutagen Society Annual Meeting, March 1998.
 45. Wilson, M.A. and Lai, H. 60 Hz magnetic field affects iron oxidation by ferritin in vitro. The Gordon Conference, July 1998.
 46. Singh, N.P. and Lai, H. Effects of EMF on DNA. "BIOSYS '99, National Seminar on Low Level Electromagnetic Field Phenomena in Biological Systems", New Delhi, India, February 3-4, 1999.
 47. Singh, N.P., Stephens R.E. and Lai, H. Visualization of DNA double strand breaks. Environmental Mutagen Society Annual Meeting, March 1999.

Invited Presentations

1. "Effects of low-level microwaves on psychoactive drug actions," presented at the Department of Pharmacology, Marquette University, Milwaukee, WI, June 1986.
2. "Effects of low-level microwaves on neurological functions," presented at the 6th US-USSR Workshop on the Study of the Biological Effects of Physical Factors in the Environment, National Institute of Environmental Health Sciences, Research Triangle Park, NC, October 1987.
3. "Effects of 147-MHz RF fields on calcium efflux from chick brain tissue in vitro," presented at the 6th US-USSR Workshop on the Study of the Biological Effects of Physical Factors in the Environment, National Institute of Environmental Health Sciences, Research Triangle Park, NC, October 1987.
4. "Neurological effects of low-level microwaves," presented at the 7th US-USSR Workshop on the Study of the Biological Effects of Physical Factors in the Environment, L'vov, Ukraine, USSR, October 1989.
5. "Neurological effects of low-level microwave irradiation," presented at the Symposium on Issues and Mechanisms of Nonionizing Radiation, 12th Annual Meeting of the Bioelectromagnetics Society, June 1990.
6. "Neurological effects of low-level microwave irradiation," presented at the 8th US-USSR Workshop on the Study of the Biological Effects of Physical Factors in the Environment, Midway, UT, June 1991.
7. "Research on the neurological effects of nonionizing radiation at the University of Washington," presented at the Symposium to honor the retirement of Dr. A.W. Guy, sponsored by the USAF School of Aerospace Medicine; Battelle Conference Center, Seattle, WA, October 1991.
8. "Neurological effects of low-level microwaves," presented at the XXIVth General Assembly of the International Union of Radio Science (URSI), Kyoto, Japan, August 25-September 2, 1993.
9. "Neurological effects of low-level microwaves", presented at the Commonwealth Science and Industry Research Organization (CSIRO), Sydney, Australia, June 29, 1994.
10. "The brain's own opiates", presented at "Making Connections Summer Institute: Celebrating the Decade of the Brain" organized by the School of Nursing, University of Washington; July 14, 1995.
11. "Neurological effects of radiofrequency electromagnetic radiation: a review", a presentation to the Toxicology Working Group, Wireless Technology Research, L.L.C., Washington, D.C., July 27, 1995.
12. "Effects of radiofrequency electromagnetic radiation exposure on the central nervous system", presented at the European Cooperation in the Field of Science and Technical Research (COST), Project 244: Biomedical Effects of

Electromagnetic Fields, 8th Workshop on Biological Effects Relevant to Amplitude Modulated RF Fields, Kuopio, Finland, September 3-4, 1995.

13. "Bioelectromagnetics research at the University of Washington: biological effects and medical applications", presented at the Battelle Pacific Northwest Research Laboratory, Richland, WA, March 29, 1996.
14. Penal presentation invited by the Washington State Board of Health regarding San Juan County citizens' concerns on cellular antenna siting, September 11, 1996.
15. "Effects of radiofrequency electromagnetic radiation on the nervous system", presented at "Unplugged: Health and Policy Implications of the Wireless Revolution", a symposium organized by the Vermont Law School Environmental Law Center, November 15-16, 1996.
16. "Effects of radiofrequency electromagnetic radiation on the nervous system", presented at the FDA Center for Devices and Radiological Health, Rockville, MD, February 7, 1997: a workshop entitled "Physical characteristics and possible biological effects of microwaves applied in wireless communication" organized by the Bioelectromagnetics Society and hosted by the FDA.
17. "Non-ionizing electromagnetic fields and spatial learning and memory functions", in a mini-symposium on 'Learning and Memory: Effects and Mechanisms', the Second World Congress for Electricity and Magnetism in Biology and Medicine, Bologna, Italy, June 8-13, 1997.
18. "Electromagnetic fields, DNA damage, and free radicals", presented at the World Conference on Breast Cancer, Kingston, Ontario, Canada, July 13-17, 1997.
19. "Neurological effects of low level microwave radiation", in Mobile Phones- Is there a Health Risk?, organized by IBC-UK Conferences Limited, in Brussels, Belgium, September 16-17, 1997.
20. "60-Hz magnetic field and DNA damages: implication on cancer development", presented at the Bioelectromagnetics Society workshop "Electromagnetic Fields and Cancer" at the Catholic University of America, Washington, D.C., February 6, 1998.
21. "Can radiation from cell phones cause neurodegenerative diseases and memory loss?", presented at the Commonwealth Science and Industry Research Organization (CSIRO), Sydney, Australia, July 29, 1998.
22. "Neurological effects of radiofrequency electromagnetic radiation", presented at the "Workshop on Possible Biological and Health Effects of RF Electromagnetic Fields", Mobile Phone and Health Symposium, Oct 25-28, 1998, University of Vienna, Vienna, Austria.
23. "Magnetic fields and malaria", presented at the "Biologic Effects of Light Symposium", held Nov 1-3, 1998, in Basel, Switzerland.
24. "Neurological effects of radiofrequency electromagnetic radiation", presented at the Wayland Forum organized by the Wayland Board of Health, Wayland, MA, February 15, 1999.

25. "Neurological effects of radiofrequency electromagnetic radiation", presented at the Department of Environmental Health, Harvard School of Public Health, Boston, MA, February 17, 1999.
26. "Going Wireless: a public forum on the health effects of microwave radiation from cell phones, antennas, and radio/TV towers" at Westminster Presbyterian Church, Tiburon, CA, April 10, 1999.
27. "Neurological effects of radiofrequency electromagnetic radiation", presented at the National Radiological Protection Board, England, June 15, 1999.
28. "Biological effects of radiofrequency radiation" at the Parliament, London, England, June 16, 1999.
29. "Neurological effects of electromagnetic fields", presented at Health Canada, Ottawa, Canada, July 29, 1999.
30. "Deciphering scientific reporting in the media", presented at the World Conference on Breast Cancer, July 26-31, 1999 in Ottawa, Canada.

JOHN A. LEONOWICH

Staff Scientist
Environmental Technology Division
Battelle Pacific Northwest Division, Pacific Northwest National Laboratory (PNNL)

EDUCATION

Ph.D., Radiological Engineering, Rensselaer Polytechnic Institute, 1985
M.P.H. Course Work, Harvard School of Public Health, 1978 B 80 (as USAF sponsored student)
M.S., Nuclear Engineering, Rensselaer Polytechnic Institute, 1976
B.S., Physics, Rensselaer Polytechnic Institute, 1974

EXPERIENCE

Dr. Leonowich has a broad background in industrial hygiene and health physics, with particular experience in the areas of non-ionizing radiation protection, chemical safety issues associated with the nuclear weapons complex, and ionizing radiation dosimetry. Dr. Leonowich has been involved with a number of Department of Energy (DOE) and Department of Defense (DOD) projects at PNNL with a total business volume of approximately \$4,000K. He is Project Manager for PNNL's support to the DOE-HQ/Office of Health rulemaking activity on worker beryllium exposure (10 CFR 850). He has participated in a number of DOE *Tiger Team* evaluations in the areas of health physics, personnel protection and industrial hygiene, as well as a participant in the DOE Chemical Vulnerability Assessments of Oak Ridge and Idaho National Engineering Laboratory. Non-ionizing radiation projects that he has managed include work for the US Navy at China Lake in California and the Jet Propulsion Laboratory in Pasadena, California. He presently is a consultant to L3 NARDA Microwave on the development of instruments to measure electromagnetic fields. He is the Secretary of Subcommittee 2 of the IEEE Standards Coordinating Committee 28 on non-ionizing radiation, as well as a member of the Control Measures working group of the ANSI Z136.1 committee on laser safety, where he serves as the Health Physics Society liaison. Dr. Leonowich has also served as an expert for the World Health Organization in the area of non-ionizing radiation, for whom he visited the country of Bahrain in the Persian Gulf in November 1995 to advise their Ministry of Health on establishing a countrywide radiation protection program. He is a voting member of the American Conference of Governmental Industrial Hygienists (ACGIH) Physical Agents (TLV - PAC) committee.

Dr. Leonowich is also currently serving as a senior consultant in health physics / industrial hygiene to the *Institute for Environmental, Safety and Occupational Health Risk Analysis*, Brooks AFB, Texas, under a cooperative DOD / DOE program. The terms of this assignment are through 30 September 2000.

Dr. Leonowich is competent in the Russian language (speaking, reading and writing) and passed the Armed Forces language comprehension test in Russian while on active duty. He is currently studying Serbo-Croatian to support USAF operations in the Balkans.

CURRENT RESEARCH INTERESTS

Dr. Leonowich is currently working on the development of criteria and instrumentation for predicting RF shock and burns as a function of voltage and amperage, associated with exposure to electromagnetic fields from 100 kHz to 110 MHz. This work is in collaboration with the U.S. Air Force Research Laboratory, Brooks AFB, TX; the Naval Surface Weapons Center (NSWC), Dahlgren, VA; Mission Research Corporation, and the Johns Hopkins University.

Dr. Leonowich is also working on a project measuring baseline levels of all forms of electromagnetic energy, both ionizing and non-ionizing, on board USAF E-3 AWACS aircraft. This is follow-on work to extensive measurements he performed on C-17, C-5, C-141, and KC-135 aircraft, as well as remote monitoring of the cosmic radiation background in U-2 aircraft.

He is also investigating limits for short pulsed electromagnetic fields associated with ultra-wide band (UWB) and other high powered microwave sources for inclusion into the next revision of IEEE C95.1 standard.

Dr. Leonowich is also a key member of the DOE team producing the DOE Standard on Exposure to Beryllium (10 CFR 850). The Notice of Proposed Rulemaking for this document was published in the Federal Register on December 3, 1998.

PROFESSIONAL AFFILIATIONS

American Conference of Governmental Industrial Hygienist
Health Physics Society
Institute of Electrical and Electronics Engineers
Bioelectromagnetics Society
Laser Institute of America

PUBLICATIONS/PRESENTATIONS

Dr. Leonowich has over 75 publications and presentations.