1 of 1

Medical Sciences Division

MASTER
Report for 1993

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This year's Medical Sciences Division (MSD) Report is organized to show how programs in our division contribute to the core competencies of Oak Ridge Institute for Science and Education (ORISE). ORISE's core competencies in education and training, environmental and safety evaluation and analysis, occupational and environmental health, and enabling research support the overall mission of the U.S. Department of Energy (DOE). As summarized in this report, the diverse activities and achievements of MSD programs clearly encompass all four competencies, which are closely aligned to the MSD mission. This mission is 1) to conduct basic and applied biomedical research on human health related to energy systems, 2) to provide technical assistance and training in occupational and environmental medicine, and 3) to make related biomedical applications available to industry through technology transfer. Many of the MSD programs are recognized worldwide for their scientific accomplishments and the expertise of staff who contribute their talents and services toward assisting a wide variety of national and international advisory and working groups.

A synopsis of accomplishments in our programs during calendar year 1993 is provided in this report. The listing of publications, reports, and related presentations documents the progress made. The section describing the training of course participants, postdoctoral fellows, guest scientists, and college students demonstrates the strong commitment of the division to training and educational activities. Also listed are the numerous collaborative arrangements with various scientific groups associated with universities, industry, and other institutions throughout the country. These activities illustrate how MSD staff extend their expertise beyond ORISE's institutional boundaries.

We sincerely hope you will find this report helpful in familiarizing yourself with the breadth of biomedical research, service, and training programs at MSD. However, the programmatic descriptions presented are not intended to be comprehensive in coverage. Thus, we encourage the reader to contact one of us or any program director for more detailed and complete information.

J. Glenn Davis
Vice President and Director

Fred L. Snyder
Associate Director

Shirley A. Fry
Assistant Director

ACRONYMS FOR NAMES OF INSTITUTIONS

ACS	American Cancer Society
DHHS	Department of Health and Human Services
DOE	U.S. Department of Energy
FDA	Food and Drug Administration
FRMAC	Federal Radiological Monitoring and Assessment Center
IAEA	International Atomic Energy Agency
JCCCNRS	Joint Coordinating Committee on Civilian Nuclear Reactor Safety
NASA	National Aeronautics and Space Administration
NCI	National Cancer Institute
NIEHS	National Institute of Environmental Health Sciences
NHLBI	National Heart, Lung, and Blood Institute
NIH	National Institutes of Health
NIOSH	National Institute of Occupational Safety and Health
NRC	Nuclear Regulatory Commission
ORAU	Oak Ridge Associated Universities
ORISE	Oak Ridge Institute for Science and Education
ORNL	Oak Ridge National Laboratory
WHO	World Health Organization

TABLE OF CONTENTS

SCOPE OF PROGRAMS

BASIC RESEARCH PROGRAMS

BIOCHEMISTRY	1
CYTOGENETICS	2

APPLIED RESEARCH PROGRAMS

CENTER FOR EPIDEMIOLOGIC RESEARCH	3
RADIATION INTERNAL DOSE INFORMATION CENTER	4

TECHNICAL ASSISTANCE PROGRAMS

CENTER FOR HUMAN RELIABILITY STUDIES	5
FACILITY SAFETY	6
OCCUPATIONAL MEDICINE	7
RADIATION EMERGENCY ASSISTANCE CENTER/TRAINING SITE	8

PUBLICATIONS, ABSTRACTS, AND INVITED LECTURES

FULL-LENGTH JOURNAL ARTICLES	9
SUBMITTED PAPERS	11
CHAPTERS, REVIEW ARTICLES, GOVERNMENT REPORTS, AND OTHER PUBLICATIONS	11
PUBLISHED ABSTRACTS, ORAL PRESENTATIONS, AND/OR POSTERS	12
INVITED LECTURES	14

COLLABORATIVE RESEARCH	16
-------------------------------------	-----------

TRAINING ACTIVITIES	17
----------------------------------	-----------

MAJOR AWARDS, HONORS, AND CURRENT APPOINTMENTS	18
---	-----------

PATENTS AWARDED	20
------------------------------	-----------

NON-DOE RESEARCH FUNDING	20
---------------------------------------	-----------

MEDICAL SCIENCES DIVISION STAFF	21
--	-----------

CONSULTANTS AND EXTRAMURAL REAC/TS FACULTY	23
---	-----------

ADMINISTRATION AND COMMITTEES	24
--	-----------

MEMBER INSTITUTIONS	25
----------------------------------	-----------

SCOPE OF PROGRAMS

BASIC RESEARCH PROGRAMS

PROGRAM DIRECTOR:
FRED L. SNYDER, Ph.D.

The ORISE Biochemistry Program is recognized worldwide for its many significant contributions to the field of lipid biochemistry. Research in this program, which has been in existence for more than 35 years, has been supported by DOE, the National Institutes of Health (NIH), the American Cancer Society (ACS), and a variety of other health-related agencies in the private sector. Experimental studies have focused on bioactive phospholipids involved in cellular signal transduction processes including their participation as second messengers, the role of phospholipids and their metabolism in membrane function, enzymatic pathways of ether-linked lipids, nutrition, cell biology, and antitumor lipids. Findings from these experiments are contributing to our comprehension of the dual role of ether lipids as both membrane components and as potent cellular mediators that act as signalling molecules or triggers for controlling intracellular biochemical processes essential for life. The broad aim of this research is to develop a

thorough understanding of the physiological role of lipids in health and in pathological processes associated with neoplastic, inflammatory, renal, respiratory, and cardiovascular disorders. Recent initiatives have incorporated molecular biology technology and genetic approaches to identify the molecular mechanisms involved in cellular responses induced by lipid mediators and activators. Postdoctoral trainees from the United States, Europe, and Asia continue to provide significant contributions to the overall productivity of the Biochemistry Program; in fact, more than 40 postdoctoral fellows have been affiliated with this program for a 1- to 2-year period since 1965.

Several noteworthy achievements during the past year in the Biochemistry Program are highlighted below:

- A unique approach based on a complex analysis of molecular species of ether-linked phospholipids in human leukemia cells revealed the nature of the specific enzymatic steps involved in the biosynthesis of choline plasmalogens, a significant structural component of membranes in tumor and myocardial tissues.
- Preliminary results obtained with NIH 3T3 fibroblasts suggest a newly identified lipid mediator of cell function (lyso-phosphatidic acid, a key lipid metabolite) can stimulate the gene expression of *c-myc*, a transcription factor and an early gene product involved in cellular proliferation.

Dr. Ten-ching Lee examines a tissue culture flask used for growing human leukemic (HL-60) cells in-vitro. HL-60 cells are used in the Biochemistry Program to study platelet-activating factor (PAF), a potent antihypertensive and inflammatory lipid molecule and a closely related structural analog that has selective antitumor properties.

- The enzymatic mechanism responsible for the transfer of arachidonate from a triacylglycerol storage pool to membrane phospholipid in HL-60 cells was elucidated in a project that focused on the molecular trafficking of arachidonic acid (a fatty acid precursor of a diverse group of bioactive lipid mediators). These results indicate the translocation of arachidonate appears to be mediated via a lipase and an arachidonoyl-CoA:lysophospholipid acyltransferase.
- Continuing studies on the characterization of a novel transacetylase recently discovered in HL-60 cells by our laboratory have shown that this enzyme activity is capable of transferring the acetate moiety of platelet-activating factor (PAF) to sphingosine, a modulator of cell signalling. Thus, the acetylation of sphingosine by the transacetylase could be an important physiological regulator of sphingosine actions on cellular responses associated with the signal transduction system. Preliminary results indicate the PAF transacetylase is distributed ubiquitously in rat tissues.

Future research directions in the Biochemistry Program will continue to center on the chemistry, metabolism, regulation, and function of ether-linked lipids in mammals using pathophysiological models that include enzymatic studies at the molecular level to those involving subcellular organelles, intact cells, and whole animals. A newly two-year funded project to be initiated will investigate bioactive pulmonary lipids as potential sensitive biomarkers for detecting deleterious biological effects of exposures to microwave radiation.

PROGRAM DIRECTOR:
L. GAYLE LITTLEFIELD, PH.D.

The Cytogenetics Program conducts basic and applied research with the support of DOE, the National Cancer Institute (NCI), and the National Institute of Environmental Health Science (NIEHS). The primary thrust of the program is the application of multiple cytogenetic endpoints as biomarkers of exposure to radiation or genotoxic chemicals. Cytogenetics

staff also provide support for the Center for Epidemiologic Research (CER) Beryllium Workers Enhanced Medical Surveillance Program by conducting laboratory studies that will allow comparisons of the sensitivity and specificity of the lymphocyte proliferation test as a biomarker for hypersensitivity to beryllium.

Cytogenetic methods are used to provide biological dose estimates in persons referred to the Radiation Emergency Assistance Center/Training Site (REAC/TS) because of suspected radiation exposures. Evaluations in persons exposed to radiation many years ago seek to determine the usefulness of cytogenetic assays as retrospective biodosimeters and as predictors of risk of late effects, such as cancer. Basic research studies are conducted to study mechanisms involved in the induction of chromosome damage by clastogenic agents, and to learn how such damage may be ameliorated or potentiated by radioprotective chemicals. Studies employ both classical cytogenetic methods and state-of-the-art fluorescence *in-situ* hybridization techniques. These latter procedures allow viewing under ultraviolet microscopy of specific chromosome pairs that have been preferentially labeled with fluorescent probes. Highlights of selected research activities include the following:

- Using chromosome aberrations in human lymphocytes as endpoints to study damage induced by neutrons having energies in the range of worker concern, we observed that 0.44 MeV neutrons were the most efficient in inducing chromosome damage, followed by 1, 2, 6, and 14 MeV neutrons, in that order.

Anne Sayer uses the newly purchased automated metaphase finder and charged coupled device television camera to study chromosome damage induced by in-vitro irradiation.

- Protection against the induction of chromosome damage by the radioprotective chemicals, dimethyl sulfoxide and WR-1065, strictly depends on the kinetic energy of the neutrons, with the least protection afforded for very slow neutrons that deposit large amounts of energy along radiation tracks.
- The aminothiols, WR-1065, is somewhat more efficient in protecting against damage induced by both X-radiation and by high-linear energy transfer neutrons than is dimethyl sulfoxide, a chemical that provides radioprotection solely by selectively scavenging OH radicals.
- Preliminary studies using fluorescent *in-situ* hybridization techniques to paint chromosomes pairs 1, 4, and 8 have demonstrated that painting detects precisely twice the amount of radiation damage that can be seen using standard techniques, that chromosome damage induced by X-rays and slow neutrons is randomly distributed among human chromosomes, and >20% of the human lymphocyte metaphases show complex chromosomal damage and rearrangements after exposures to doses as low as 0.2 Gy of 0.44 MeV neutrons.

In the future, we will continue to emphasize the application of fluorescent *in-situ* hybridization techniques for evaluating chromosome damage in cells irradiated *in-vitro* and in cultured lymphocytes of persons exposed in radiation accidents. Under the continuing sponsorship of the Radiation Epidemiology Branch of the NCI, we are undertaking a study in which chromosome painting techniques will be used to quantify aberrations in lymphocytes of persons who were involved as cleanup workers following the Chernobyl reactor accident. We also plan to use chromosome painting to study the cellular spectrum of damage induced by radiations of different energies. Our capabilities in the laboratory to perform these evaluations have been significantly enhanced by the recent purchase of an automated metaphase finder and a charged coupled device color television camera. The metaphase finder scans a series of microscope slides, recording the location of metaphase spreads identified by its image analyzing computer program. Metaphases can then be recalled for evaluation by an operator with the simple push of a button. This unit vastly reduces the time required for scoring large numbers of metaphases.

Wilma Patt, Pat Deems, and Joyce Phillips (l to r) consult on data collected for the Tennessee Cancer Reporting System, a tumor registry that CER is providing quality control services for to the state of Tennessee.

APPLIED RESEARCH PROGRAMS

PROGRAM DIRECTOR:
DONNA L. CRAGLE, PH.D.

The Center for Epidemiologic Research (CER) has continued to conduct occupational epidemiologic studies of DOE worker populations in support of the research agendas of DOE and the Department of Health and Human Services (DHHS). Funding for ongoing studies ceased at the end of FY-93 as required by the 1990 memorandum of understanding between DOE and DHHS. The University of North Carolina's association with us as a coinvestigator on these studies since 1979 also ended at the end of FY-93.

Work done directly for DOE continues to focus on short-term quick response studies and technical support for areas of DOE programmatic interest such as epidemiologic surveillance. DHHS released five requests for proposals during 1993 and CER successfully bid for two of them. One contract will involve clinical reexamination of a cohort of mercury workers at the Y-12 plant, the other will provide technical support to National Institute of Occupational Safety and Health (NIOSH) for the continuation of some of the health and mortality work that was previously conducted at CER. Although the award of these NIOSH contracts was helpful in ensuring CER's future, efforts continue to identify other agencies and industries having work compatible with CER's areas of expertise. In this

search, we successfully responded to a request for proposals and were awarded a contract with the state of Tennessee to provide quality control on the State Tumor and Birth Defects Registries for three years.

Major programmatic developments during the past year include:

- Implementation of the Beryllium Workers Enhanced Medical Surveillance Program designed to screen present and former Y-12 beryllium workers for the presence of chronic beryllium disease (CBD) and to evaluate (under a research protocol) the lymphocyte proliferation test as a screening test for CBD. One hundred-fifty workers were screened by the end of December 1993.
- Data collection began on the project for the state of Tennessee that involves visiting each of 150 hospitals in the state once a year for three years. During each hospital visit, records will be reviewed for all birth defects reported by the hospital in a specified calendar year, and a random sample of newly reported cancer cases in a specified year will be reabstracted for a quality check.
- A feasibility study was initiated for determining the number of childhood leukemias and lymphomas that were newly diagnosed between 1947 and 1990 in the counties surrounding the Oak Ridge complex. If sufficient medical records are located for this time period, work may proceed to include these cases in an ongoing study being conducted for NIOSH at Battelle Memorial Institute aimed at investigating the relationship between paternal radiation exposure and incidence of these cancers.
- Technical support was provided to DOE's Office of Epidemiology and Health Surveillance in the development of epidemiologic surveillance. CER acted as a data center for DOE, receiving data for absences of five or more days from various facilities, coding the cause of absence, and tabulating disease rates by specified disease categories to meet the needs of DOE and occupational physicians at the facilities.
- Work continued on the Comprehensive Epidemiologic Data Resource (CEDR) as all computerized data possessed by CER were formatted, documented, and described according to the requirements of the CEDR system.

CER will continue to assist DOE in implementation of any new epidemiologic or technical needs related to the health of the DOE work force. Staff members will continue to submit proposals in response to announcements of new studies to be competitively funded by DOE, DHHS, or any other agency or industry needing occupational epidemiologic support.

PROGRAM DIRECTOR:
EVELYN E. WATSON, B.A.

The Radiation Internal Dose Information Center (RIDIC) plays a dual role at the ORISE Medical Sciences Division (MSD). The RIDIC staff provides information about radiation dose from radionuclides incorporated in the body to people who request it and conducts research designed to improve internal radiation dosimetry. As the use of radioimmunotherapy and

Evelyn Watson discusses the mathematical models of a first-, second-, and third-trimester pregnant woman. RIDIC staff along with scientists at ORNL have completed the development of these models, and RIDIC staff continue to code the model for the end of the second trimester.

other radionuclidic therapy increases, more accurate radiation dose estimates are needed. The short-range emissions of beta and alpha emitters that are being introduced for therapy require new approaches such as small-scale, cellular, and even microdosimetry techniques.

The RIDIC accomplishments during 1993 include:

- The center responded to more than 400 calls for information from nuclear medical centers, nuclear pharmacies, radiopharmaceutical manufacturers,

DOE, DOE contractors, the Food and Drug Administration (FDA), the Nuclear Regulatory Commission (NRC), the NIH, and others. The number of requests for information about the radiation dose from radiolabeled monoclonal antibodies and from positron-emitting radionuclides continued to increase.

- The bibliographic data base maintained by RIDIC now has more than 38,500 entries on information needed for radiation dose calculation, an increase of more than 1,500 entries during the year. The data base was upgraded to the BASICPlus data management system.
- Development of the mathematical models of the pregnant woman for the first, second, and third trimesters has been finished. The RIDIC staff continues coding the model for the end of the second trimester into the computer software used for calculating energy deposition from radionuclides in the body.
- The model of the gastrointestinal tract of Reference Man developed at RIDIC is still being considered by the International Commission on Radiological Protection and others to be used as the recommended model for radiation protection purposes. This model allows more flexibility in incorporating age- and gender-dependent physiological parameters than the model currently used.
- RIDIC manages the ORISE MSD whole body counter. Employees of ORISE whose work requires periodic determination of any radioactive material taken into the body have been evaluated.
- Michael Stabin of the RIDIC staff provided expert assistance on radiation dose from a nuclear medicine procedure to a law firm in Washington, D.C.
- The MIRDOSE software developed by RIDIC has been distributed to more than 1,000 people around the world. The third version (MIRDOSE3) will be ready for release soon for both IBM-compatible and Macintosh computers.

The RIDIC staff will continue to disseminate radiation dose information to all requesters. The mathematical models representing the pregnant woman at various stages of gestation will be used to develop absorbed fractions of energy for use in making dose calculations. Software implementation of a urinary bladder dosimetry model and a new bone marrow model will be completed and issued. The staff continues to develop more capability in the field of occupational and external dosimetry. Plans are being developed to collect and process patient-specific data for absorbed dose calculations, primarily for planning treatments with monoclonal antibodies and other radionuclide agents. Collaborative efforts will continue with groups at Oak Ridge National Laboratory (ORNL) and others.

TECHNICAL ASSISTANCE PROGRAMS

PROGRAM DIRECTOR:

GERHARD R. EISELE, PH.D.

The Center for Human Reliability Studies (CHRS) provides technical and programmatic support to a number of programs for the DOE Office of Safeguards and Security. Tasks include evaluating, reviewing, and advising on numerous personnel security clearance issues; various personnel security processes; and human reliability programs. By focusing on programmatic consistency through research and analysis, technical guidance, and operational support, a vehicle is provided for achieving quality-oriented programs.

One area of operational support was the development and implementation of the Personnel Security Assurance Program (PSAP), which requires an initial screening and periodic evaluation of individuals who apply for or occupy certain positions that are critical to national security. These evaluations are intended to identify individuals who may engage in behavior, develop conditions, or become involved in situations that might result in defects in their judgment or reliability.

Another example of operational support was the assistance provided to DOE in implementing the Accelerated Access Authorization Program (AAAP). This voluntary program was established by DOE in response to a pressing need for more expeditious processing of access authorization (personnel security clearance) requests. The AAAP does not replace the current access authorization process, but allows workers who successfully complete the program to perform their duties while a full background investigation is being conducted. The AAAP is, in effect, a supplement to the Interim Access Authorization procedure and is composed of three elements—a drug test, a psychological evaluation, and a counterintelligence polygraph examination.

The DOE Office of Contractor Employee Protection asked CHRS to assist them in developing procedures and in conducting actual investigations of allegations from DOE

contractor employees of employer reprisals resulting from disclosure of information or refusal to engage in practices the employees believe to be unsafe; to violate laws, rules or regulations; or to involve fraud, mismanagement, waste, or abuse.

Major accomplishments of CHRS during 1993 include:

- Presenting training entitled Detection of Unusual Behavior in the Workplace for employees covered by the Nuclear Explosive Safety - Personnel Assurance Program.

Sandy Womble and Carl Blier set up an exhibit on the Personnel Security Assurance Program, a DOE and contractor human reliability program that CHRS staff support on behalf of DOE's Office of Safeguards and Security.

- Reviewing and preparing technical information including legal reviews relating to current and proposed substance abuse and alcohol testing policies.
- Identifying relevant information for evaluating the PSAP and the AAAP for program consistency.
- Completing a study of structured interview components for inclusion into the AAAP.
- Developing an electronic bulletin board system for use by DOE and DOE contractor personnel.
- Conducting a workshop for PSAP Approving Officials and Administrators which gave them a forum to discuss issues confronting the various facilities, future needs, and the resources required to met those needs.
- Developing and presenting a new course for DOE entitled Personnel Security Specialist Adjudication Training.
- Developing and analyzing a questionnaire to measure job satisfaction and stress in the workplace as a predictor of insider behavior.

- Conducting an investigation for the Office of Contractor Employee Protection on allegations of employer reprisal resulting from employee disclosure of unsafe practices.

CHRS continues to actively support DOE Headquarters staff in the successful implementation of these programs by providing expertise in the following disciplines: personnel security; clinical psychology; human resources management research and analysis; law, including labor and personnel law; financial analysis; organizational and industrial psychology; social psychology and sociology; counterintelligence; criminology, criminal justice, and investigations; operations research and statistics; and computer systems analysis. This comprehensive process of policy analysis, program development, operational implementation, and follow-up program support and evaluation will continue to be utilized in order to ensure that products and programs maintain the highest standards possible. Teaming will also continue with the Central Training Academy in developing and evaluating training programs dealing with personnel security, human reliability, and other security-related subject areas.

PROGRAM DIRECTOR:
TOMMY F. McCRAW, B.S.

The Pantex Plant is the United States' only facility where nuclear weapons can be assembled or disassembled. This DOE plant is located on a 16,000-acre site 17 miles northeast of Amarillo, Texas. The plant has been operated for DOE by Mason & Hanger-Silas Mason Co., Inc. since 1956 and is managed under the Assistant Secretary for Defense Programs (DP). For 1993, ORISE efforts in nuclear facility safety included providing technical expertise and assistance to DOE-DP managers for nuclear facility safety and nuclear weapon safety for the Pantex Plant. The major activity is the dismantlement of thousands of nuclear weapons and the disposal or storage of weapon components. Pantex is scheduled to disassemble 1,000 to 2,000 nuclear weapons per year for the next 5 to 7 years, which will create a large inventory of plutonium-239. This will be an extremely valuable national resource. The most logical and by far the

most cost-effective way to finally dispose of this huge stockpile of plutonium is through irradiation as fuel elements in nuclear reactors. Here it can be effectively safeguarded, and, in breeder reactors, will produce a vast quantity of electrical energy.

The primary thrust of ORISE support to DP is assistance with the review of Safety Analysis Reports (SARs) and the development of Safety Evaluation Reports (SERs) mandated by relatively new DOE safety requirements. These safety analyses must consider all credible incidents that could result in a release of radioactivity, including fire, flood, tornado, earthquake, and others such as an aircraft's crashing into a facility at the plant. The SER must be developed by an independent expert group, which in this case is the Technical Safety Review Panel. As a member of this panel, Facility Safety supports DP efforts to comply with DOE's environment, safety, and health requirements and with other applicable federal and state requirements. This involves numerous meetings of the Technical Safety Review Panel and visits to Pantex. The process for approval of nuclear weapon operations at Pantex involves management review and approval of the SER. In 1993, the first facility for which this SAR and SER process was completed involved the Zone 4 magazines, where nuclear weapon pits in their steel containers are placed for what is currently referred to as temporary storage. These magazines, and there are two types, are earth-covered bunkers originally designed for munitions storage. These bunkers contain no electrical service or any other feature that could pose a hazard. The only flammables that could support combustion in a locked bunker are the tags and labels on the pit containers. There are a number of additional SARs in progress for bays, cells, and staging facilities at Pantex that the Technical Safety Review Panel is reviewing.

Other similar technical support provided by ORISE in 1993 involves support of safety studies of National Aeronautics and Space Administration (NASA) missions involving vehicles with radioisotope thermoelectric generators provided by DOE. These contain large quantities of plutonium-238. Mr. McCraw is a member of a Bio-Environmental Effects Subpanel of the Interagency Nuclear Safety Review Panel. This panel, created by a presidential directive, develops analyses of credible accidents and provides advice on the safety of these missions to the highest level of government. The Bio-Environmental Effects Subpanel study in 1993 involved safety of NASA's Cassini vehicle to be launched to Saturn in October, 1997. A future study will include the Topaz vehicle, which will fly a Russian Topaz reactor.

OCCUPATIONAL MEDICINE

PROGRAM DIRECTOR:

DALE E. MITNER, M.D.

The Occupational Medicine Program provides technical assistance to the DOE Office of Occupational Medicine (OOM) for a wide range of occupational medicine activities. Technical assistance and medical review officer services are also provided to the DOE Federal Employee Drug Free Workplace Program. Staff physicians and technical experts assist in DOE Headquarters' site reviews of DOE contractor occupational medicine programs for OOM. The program also administers the occupational medicine programs at all ORISE locations.

Accomplishments for 1993 include:

- Providing medical reviewers for 22 Headquarters' reviews of DOE contractor occupational medicine programs.
- Coordinating and assisting in the training of physician reviewers who would participate in DOE appraisals of DOE contractor occupational medicine programs.
- Coordinating working groups and providing technical assistance in the areas of medical standards and psychological assessment, medical surveillance,

Donna Kennedy, Occupational Medicine's program manager, presents ORAU employees with information on good nutrition by discussing the number of servings in each of the food groups the average-sized person should eat in a day.

medical standards, cardiovascular testing, and medical surveillance systems.

- Providing technical assistance to the Office of Procurement, Assistance and Program Management (PR-15) by participating in the working group entitled Workplace Substance Abuse Programs at DOE Sites.
- Coordinating and sponsoring a 30-day preceptorship of an occupational medicine resident for OOM.
- Providing faculty and medical coverage for Radiation Emergency Assistance Center/Training Site (REAC/TS).
- Coordinating the meeting arrangements and the agendas for the symposium on DOE medical computing and the annual DOE contractor occupational medicine program.
- Reviewing the quality assurance aspects of medical services provided in the Marshall Islands for OOM.
- Providing oversight and professional assistance to the Oak Ridge Associated Universities Animal Use Standards Committee.
- Designing and conducting health promotion activities, including National Health and Fitness Day and a health fair, for ORAU employees following a needs assessment.
- Assisting in the investigation of medically related accidents, employee complaints, and an outbreak of foodborne illness.
- Reviewing and providing medical opinions on waivers and appeals concerning protective force personnel medical requirements.
- Providing medical review officer (MRO) services for the DOE Drug Free Workplace Program. During 1993, laboratory results of 700 drug tests were reviewed and evaluated.

PROGRAM DIRECTOR:
ROBERT C. RICKS, Ph.D.

The Radiation Emergency Assistance Center/Training Site (REAC/TS) continues to assist DOE, the World Health Organization (WHO), and the International Atomic Energy

Agency (IAEA) in the areas of medical management in radiation accidents and training of medical, nursing, medical support, and health physics personnel for radiation accident response. Training also is provided in occupational and radiological health for physicians and clinical staff in nuclear facilities as well as for attorneys. The program also provides medical support to the DOE's Accident Response Group and the Federal Radiological Monitoring and Assessment Center (FRMAC) and is prepared to assist DOE Defense Programs/contractor facilities and commercial nuclear power plants. An experienced emergency response team consisting of physicians, nurses, health physicists, coordinators, and additional support personnel is on 24-hour call to provide consultation or direct medical and radiological assistance in the event of a major radiation accident.

Dr. Mary Ellen Berger and Joe Kilpatrick, nurses, conduct an inventory of REAC/TS' trauma pack, a kit that can be taken to the site of an accident. The pack contains emergency medications and medical supplies.

Among its accomplishments in 1993, REAC/TS staff:

- Presented 12 fully subscribed, regularly scheduled 3 1/2- and 5-day courses at its facility in Oak Ridge; they were attended by 276 participants, including 52 from institutions outside the United States.
- Presented a symposium in Nashville, TN entitled Medical/Legal Issues Associated with Ionizing Radiation; 37 attorneys from the United States and 5 other countries participated.

- Conducted one- and two-day courses in support of medical preparedness for radiation accidents at Memorial Mission Medical Center, Asheville, NC; Wilford Hall USAF Medical Center, San Antonio, TX; Walter Reed Army Medical Center, Silver Springs, MD; Martin Marietta Specialty Components, Pinellas, FL; VA Medical Center, Amarillo, TX; and Washoe Medical Center, Reno, NV.
- Assisted Westinghouse by providing one- and two-day training courses on the medical aspects of radiation accident preparedness at 11 hospitals in Idaho, Utah, and Wyoming in support of DOE's Waste Isolation Pilot Project. A total of 105 prehospital and hospital response personnel attended these courses.
- Participated in the FRMAC training course in preparation for the FRMAC-93 nuclear power plant exercise and later provided on-site assistance to FRMAC during the exercise conducted June 29-July 1, 1993, in Omaha, NE.
- Participated in the Fourth WHO Collaboration Center meeting in Ulm, Germany. In addition to information exchanges on centers' activities and accident updates, two videoconferences involving participants at the Ulm meeting and other members of REAC/TS' clinical staff in Oak Ridge, and clinicians and other scientists in Moscow, successfully tested the consultation capabilities among the international radiation accident response community.
- Responded to 114 calls for assistance, including support to the NRC by providing cytogenetic dose estimates and radiological health counselling to some of the 94 persons involved in the fatal (1 death) Indiana, PA, iridium-192 accident.
- Assisted U.S. Department of Defense in support of U.S. assistance to Lithuania and Romania in planning for major radiological disasters.

REAC/TS will continue providing emergency medical response and training in management of medical problems arising from radiation accidents, and supporting DOE's Defense Programs, Emergency Operations Division, and FRMAC, as necessary. Reorganization of the Radiation Medicine Program into REAC/TS will provide DOE Environment, Safety and Health with a comprehensive capability in the medical aspects of radiation emergency response and training for its contractor medical staffs. This capability becomes increasingly vital as environmental restriction and management of radioactive wastes proceed.

PUBLICATIONS, ABSTRACTS, AND INVITED LECTURES

FULL-LENGTH JOURNAL ARTICLES

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Evaluation of the monoamine uptake site ligand I-123 methyl 3B/B-(4-iodophenyl)- tropane-2B-carboxylate I-123 B-CIT in nonhuman primates: Pharmacokinetics, biodistribution, and SPECT brain imaging coregistered with MIR.

Nucl. Med. Biol. - Int. J. Rad. App. B 20, 597-606, 1993

Blank, M. L., Fitzgerald, V., Lee, T.-c., and Snyder, F.
Evidence for biosynthesis of plasmenylcholine from plasmenylethanolamine in HL-60 cells.

Biochim. Biophys. Acta 1166, 309-312, 1993

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Arachidonate-containing triacylglycerols: Biosynthesis and a lipolytic mechanism for the release and transfer of arachidonate to phospholipids in HL-60 cells.

Biochim. Biophys. Acta 1170, 275-282, 1993

Eary, J. F., Collins, C., Stabin, M., Vernon, C., Petersdorf, S., Baker, M., Hartnett, S., Ferency, S., Addison, S. J., Appelbaum, F., and Gordon, E. E.
Samarium-153-EDTMP biodistribution and dosimetry estimation.

J. Nucl. Med. 34(7), 1031-1036, 1993

Fry, S. A., Dupree, E. A., Sipe, A. H., Seiler, D. L., and Wallace, P. W.

A study of mortality and morbidity among persons occupationally exposed to ≥ 50 mSv in a year.

Phase I: Mortality through 1984.

IN PRESS: *Appl. Occup. Environ. Hyg.*

Gilbert, E. S., Cragle, D. L., and Wiggs, L. D.

Updated analyses of combined mortality data on workers at the Hanford Site, Oak Ridge National Laboratory, and Rocky Flats Weapons Plant.

IN PRESS: *Radiat. Res.*

Hoffmann, G. R., Colyer, S. P., and Littlefield, G. L.
Induction of micronuclei by bleomycin in G₀ human lymphocytes: I. Dose-response and distribution.
Environ. Mol. Mutagen. 21(3), 130-135, 1993

Hoffmann, G. R., Colyer, S. P., and Littlefield, G. L.
Induction of micronuclei by bleomycin in G₀ human lymphocytes: II. Potentiation by radioprotectors.
Environ. Mol. Mutagen. 21(3), 136-143, 1993

Littlefield, L. G. and Hoffmann, G. R.
Modulation of the clastogenic activity of ionizing radiation and bleomycin by the aminothiol WR-1065.
Environ. and Mol. Mutagen. 22, 225-230, 1993

Littlefield, L. G., Joiner, E. E., Colyer, S. P., Sallam, F., and Frome, E. L.
Concentration dependent protection against X-ray induced chromosome aberrations in human lymphocytes by the aminothiol WR-1065.
Radiat. Res. 133, 88-93, 1993

McFee, A. F., Abbott, M. G., Gulati, D. K., and Shelby, M. D.
Results of mouse bone marrow micronucleus studies in 1,4-dioxane.
IN PRESS: *Mutagenesis*

McFee, A. F., Cook, S. B., and Abbott, M. G.
A negative dose-response relationship for radiation-induced micronuclei in polychromatic erythrocytes of mice.
IN PRESS: *Environ. Mol. Mutagen.*

Mozley, P. D., Stubbs, J. B., Stabin, M. G., Kung, M. F., Selikson, M. H., and Alavi, A.
The dosimetry of I-123 IBF: A reversible ligand for imaging the D2 dopamine receptor with SPECT.
IN PRESS: *J. Nucl. Med.*

Richardson, V. B., Littlefield, L. G., and Sayer, A. M.
Cell cycle stage specificity of the MTX block as resolved by X-ray-induced chromosome damage.
IN PRESS: *Cytogenet. Cell Genet.*

Shelby, M. D., Erexson, G. L., Hook, G. J., and Tice, R. R.
An evaluation of a 3-exposure mouse bone marrow micronucleus test on 49 chemicals.
Environ. Mol. Mutagen. 21, 160-179, 1993

Snyder, F., Lee, T.-c., and Uemura, Y.
Involvement of a CoA-independent transacylase and unique transacylase in the metabolism of PAF and related acetylated lipids.
IN PRESS: *J. Lip. Med.*

Stabin, M. G.
Radiation dose to the upper spine from therapeutic administrations of I-131 sodium iodide.
J. Nucl. Med. 34, 695-696, 1993

Stabin, M. G., Eckerman, K. F., Ryman, J. C., and Williams, L. E.
Bremsstrahlung radiation dose.
IN PRESS: *J. Nucl. Med.*

Stabin, M. G., Turner, J. E., Hamm, R. N., and Bolch, W. E.
Track-structure simulation and determination of product yields in the electron radiolysis of water containing various solutes.
Radiat. Prot. Dosim. 1993

Stubbs, J. B. and Marshall, B. J.
Radiation dose estimates for the C-14 urea breath test.
J. Nucl. Med. 34, 821-825, 1993

Tankersley, W. G., West, C. M., Reagan, J. L., and Watson, J. E.
Assessment of radiation exposure at or below the minimum detectable level in epidemiologic studies.
IN PRESS: *Appl. Occup. Environ. Hyg.*

Watson, E. E., Stabin, M. G., and Siegel, J.
MIRD Formulation.
Med. Phys. 20(2), Pt 2, 511-514, 1993

Wing, S., Shy, C. M., Wood, J. L., Wolf, S., Cragle, D. L., Tankersley, W., and Frome, E. L.
Job factors, radiation and cancer mortality at Oak Ridge National Laboratory: Follow-up through 1984.
Am. J. Ind. Med. 23, 265-279, 1993

Zeiger, E., Shelby, M. D., and Witt, K. L.
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Environ. Mol. Mutagen. 21, 309-318, 1993

SUBMITTED PAPERS

Hoffmann, G. R., Sayer, A. M., and Littlefield, L. G.
Potentiation of bleomycin by the aminothiol WR-1065 in assays for chromosomal damage in human lymphocytes.
Mutat. Res. 1994

Lee, T.-c., Fitzgerald, V., Chatterjee, R., Malone, B., and Snyder, F.
Differentiation-induced increase of platelet-activating factor acetylhydrolase in HL-60 cells.
J. Lip. Med. 1993

McFee, A. F., Robertson, S. D., and Washburn, L. C.
Cytogenetic damage in marrow cells of mice after injections of yttrium-90-labeled monoclonal antibody.
Nucl. Med. Biol. 1994

Stabin, M. G.
A model of the prostate gland for use in internal dosimetry.
J. Nucl. Med. 1993

Watson, J. E., Wood, J. L., Tankersley, W. G., and West, C. M.
Estimation of radiation doses for workers without monitoring data for retrospective epidemiologic studies.
Health Phys. 1993

CHAPTERS, REVIEW ARTICLES, GOVERNMENT REPORTS, AND OTHER PUBLICATIONS

Berger, M. E., Byrd, B. L., Ricks, R. C., and West, C. M.
Transport of Radioactive Materials: Q&A about Incident Response
32 pp. Oak Ridge Associated Universities, Oak Ridge, Tenn., 1992.

Blank, M. L. and Snyder, F.
Chromatographic analysis of ether-linked glycerolipids, including platelet-activating factor and related cell mediators.
IN PRESS: **Lipid Chromatographic Analysis**

Byrne, J. F. and Eisele, G. R.
MMPI critical factors in the psychological assessment component. (Restricted distribution)
Center for Human Reliability Studies, Accelerated Access Authorization Program. Oak Ridge, TN, August 1993

Center for Human Reliability Studies and Central Training Academy
Management Seminar—Personnel Security Adjudications, Participant's Handbook
Center for Human Reliability Studies, August 1993

Cragle, D. L. and Butler, A. F.
Classifying unspecified and/or unexplained causes of death. (Letter to the Editor)
Am. J. Public Health 83, 1492-1493, 1993

Fry S. A., Cragle, D. L., Crawford-Brown, D. J., Dupree, E. A., Frome, E. L., Gilbert, E. S., Petersen, G. R., Shy, C. M., Tankersley, W. G., Voelz, G. L., Wallace, P. W., Watkins, J. P., Watson, J. E., Jr, and Wiggs, L. D.
Studies of health and mortality among contractor employees at United States Department of Energy facilities.
IN PRESS: **Radiation and Society**. American Chemical Society: Washington, D.C.

Fry S. A. and Fong, F. H.
Radiation injury.
IN PRESS: **The Pharmacologic Approach to the Critically Ill Patient**. Third Edition. (Chernow, B., ed.)
Williams and Wilkins: Baltimore, MD

Littlefield, L. G., Joiner, E. E., Colyer, S. P., and Frome, E. L.
Radioprotective chemicals as tools for studying mechanisms of radiation-induced chromosome damage in human lymphocytes.
IN PRESS: **Proceedings of Second International Symposium on Chromosomal Aberrations**. (Natarajan, A. T. and Obe, G., eds.) University of Essen, Essen, Germany, November 1992

Seeger, K. A.
An assessment of available instruments for psychological evaluations.
Personnel Security Assurance Program, Center for Human Reliability Studies, Oak Ridge, TN
(ORISE 92/G-19), May 1992

Seger, K. A., Childress, T. E., Eisele, G. R., and Blier, C. J.

The role of the PSAP in managing the insider threat of the future.

Personnel Security Assurance Program, Center for Human Reliability Studies, Oak Ridge, TN
(ORISE 93/F-12), April 1993

Snyder, F.

Biosynthesis and catabolism of PAF.

The Handbook of Immunopharmacology - Lipid Mediators. (Cunningham, F.M. ed.)
181-192, Academic Press: London, 1993

Snyder, F., Lee, T.-c., Uemura, Y., and Ou, M.-c.

The role of a novel PAF transacetylase in the biosynthesis of a diverse group of acetylated lipids.

IN PRESS: **The Proceedings of the Third International Conference of Lipid Mediators in Health and Disease (LMHD).** (Zor, U., ed.) October 31 - November 4, 1993

Snyder, F., Uemura, Y., Lee, T.-c., and Blank, M. L.

The role of a CoA-independent transacylase in the movement of arachidonate among phospholipids and the synthesis of PAF.

Eicosanoids and Other Bioactive Lipids in Cancer, Inflammation and Radiation Injury. (Honn, K. V., Marnett, L. J., Nigam, S., and Walden, T., Jr., eds.) 691-697, Kluwer Academic Pub.: Norwell, MA, 1994

Stabin, M. G.

Internal radiation dosimetry. Principles and practices. (Karesh, S., et al., eds.) Mosby: St. Louis, MO, 1994
IN PRESS: **Nuclear Medicine.**

Stabin, M. G.

Internal dosimetry in pediatric nuclear medicine. Springer-Verlag: NY, 1994
IN PRESS: **Pediatric Nuclear Medicine.**

Stabin, M. G. and Hach, A.

Radiation dosimetry and safety (Hahn, K. and Gilday, D., eds.) Gustav Fischer Verlag: New York, NY, 1994
IN PRESS: **Handbook of Nuclear Medicine.**

Stabin, M. G., Stubbs, J. B., and Watson, E. E.

Editorial: Recent controversy in radiation dosimetry.
Eur. J. Nucl. Med. 20(5), 371-372, 1993

Stubbs, J. B.

Letter to the Editor: "The small intestine and colon."
Eur. J. Nucl. Med. 20(4), 362-363, 1993

Treves, S., O'Tuama, L., Stabin, M. G., Paltiel, H., Larar, G., and Swift, P.

Pediatric nuclear medicine. (Wagner H., Jr., ed.) Saunders: Philadelphia, PA 1994

IN PRESS: **Principles of Nuclear Medicine.**

Watson, E. E.

Book Review: Biophysical aspects of auger processes.
Radiat. Res. 134, 256-257, 1993

PUBLISHED ABSTRACTS, ORAL PRESENTATIONS, AND/OR POSTERS

Blier, C. J. and Eisele, G. R.

Derogatory issues.
PRESENTED AT: 10 C.F.R. 707 Conference.
Las Vegas, NV, April 5-8, 1993

Cook, S. E., Abbott, M. G., and McFee, A. F.

Influence of cell cycle delay on peak incidence of micronuclei in mouse marrow cells.
Environ. Mol. Mutagen. 21(suppl. 22), 15, 1993

Dupree, E., Watkins, J., Ingle, J., Wallace, P., West, C., and Tankersley, W.

Risk of lung cancer among uranium processing workers.
Am. J. Epidemiol. 138, 640, 1993

Eisele, G. R.

Human reliability programs of the Department of Energy.
PRESENTED AT: Personnel Assurance Program
Psychological Assessments Seminar.
Las Vegas, NV, March 29-April 1, 1993

Eisele, G. R.

PSAP communications and research needs.
PRESENTED AT: Personnel Security Assurance Program
Approving Officials Meeting.
Germantown, MD, March 2-3, 1993

Herscovitch, P., Carson, R. E., Stabin, M. G., and Stubbs, J. B.

A new kinetic approach to estimate the radiation dosimetry of flow-based radiotracers.

PRESENTED AT: 40th Annual Meeting of Society of Nuclear Medicine.

Toronto, Ontario, Canada, June 8-11, 1993

J. Nucl. Med. 34(5), P155, 1993

Hoffmann, G. R., Sayer, A. M., and Littlefield, L. G.

Enhancement of the clastogenic action of bleomycin by the aminoethiol WR-1065.

Environ. Mol. Mutagen. 21(suppl. 22), 29, 1993

Joiner, E. E., Sayer, A. M., and Littlefield, L. G.

Modulation of X-ray induced chromosome aberrations in cycling lymphocytes by WR-1065 and DMSO.

Environ. Mol. Mutagen. 21(suppl. 22), 33, 1993

Lee, T.-c., Fitzgerald, V., Chatterjee, R., Malone, B., and Snyder, F.

Induction and secretion of a new isoform of PAF acetylhydrolase by differentiated HL-60 cells.

PRESENTED AT: Twenty-Eighth Annual Southeastern Regional Lipid Conference.

Cashiers, NC, October 20-22, 1993

Lee, T.-c. and Malone, B.

Ether-containing inositol phospholipids in HL-60, EL-4, and Thy-1⁺ lymphoma cells.

FASEB J. 7(7), A1046, 1993

Lee, T.-c., Ou, M.-c., Malone, B., and Snyder, F.

N-acetylation of sphingosine by platelet-activating factor in HL-60 cells (poster).

PRESENTED AT: 1993 Gordon Research Conference on Lipid Metabolism.

Kimball Union

Meriden, NH June 28-July 2, 1993

Littlefield, L. G., Colyer, S. P., Joiner, E. E., and Frome, E. L.

Protection against neutron-induced chromosome aberrations by DMSO; Dependence on neutron energy.

Environ. Mol. Mutagen. 21(suppl. 22), 41, 1993

Ou, M.-c., Malone, B., Lee, T.-c., and Snyder, F.

Transacetylase-catalyzed formation of acetylated sphingosines with platelet-activating factor (PAF) as the acetate donor in human HL-60 cells.

FASEB J. 7 (7), A1265, 1993

Smith, Z. L., Cress, E. A., Blank, M. L., and Snyder, F.

Molecular species of ethanolamine plasmalogens in rat tissues are altered by fish oil diets.

PRESENTED AT: Twenty-Eighth Annual Southeastern Regional Lipid Conference.

Cashiers, NC, October 20-22, 1993

Stabin, M. G.

Radiation dosimetry of Tc-99m antimony trisulfide colloid in visualization of internal mammary lymph nodes.

PRESENTED AT: 40th Annual Meeting of Society of Nuclear Medicine.

Toronto, Ontario, Canada, June 8-11, 1993

J. Nucl. Med. 34(5), P156, 1993

Stubbs, J. B. and Goodman, M. M.

Radiation dose estimates for F-18 4-fluoro-4-deoxyglucose (4-FDG).

PRESENTED AT: 40th Annual Meeting of Society of Nuclear Medicine.

Toronto, Ontario, Canada, June 8-11, 1993

J. Nucl. Med. 34(5), P159, 1993

Stubbs, J. B., Stabin, M. G., Mozley, P. D.,

Selikson, M. H., Kung, H. F., and Alavi, A.

The dosimetry of I-123 IBF: An imaging ligand of the D2 dopamine receptor.

PRESENTED AT: 40th Annual Meeting of Society of Nuclear Medicine.

Toronto, Ontario, Canada, June 8-11, 1993

J. Nucl. Med. 34(5), P158, 1993

Stubbs, J. B., Vallabhajosula, S., Lister-Jones, J., and Smith, T. D.

Radiation dose estimates for Tc-99m P215: A peptide for imaging of atherosclerotic plaques.

PRESENTED AT: 40th Annual Meeting of Society of Nuclear Medicine.

Toronto, Ontario, Canada, June 8-11, 1993

J. Nucl. Med. 34(5), P156, 1993

Stabin, M. G., Watson, E. E., and Feld, T.

MIRDose 3 - The PC and MAC-based program for MIRD calculations in adults, children, and pregnant women.

PRESENTED AT: Health Physics Society Annual Meeting. Atlanta, GA, July 11-15, 1993

Watkins, J. P. and Frome, E. L.

Time-related variables in an occupational cohort setting.
PRESENTED AT: American Statistical Association 153rd Annual Meeting, Biometric Society Eastern and Western North American Regions and The Institute of Mathematical Statistics 56th Annual Meeting.
San Francisco, CA, August 8-12, 1993

Watkins, J., Reagan, J., Cragle, D., West, C., and Tankersley, W.

Using data thoughtfully: Impact of data validation results on an epidemiologic mortality study of nuclear industry workers.
PRESENTED AT: Occupational Exposure Database Conference.
McLean, VA, October 31 - November 3, 1993

INVITED LECTURES

Berger, M. E.

Hospital management in multi-causality incidents involving radiation.
PRESENTED AT: The EMAP Annual Training Seminar.
Philadelphia, PA, September 1993

Burr, W. W.

The status of DOE medical standards for fire fighters.
PRESENTED AT: The DOE/Contractor Fire Protection Meeting.
Augusta, GA, March 17, 1993

Burr, W. W.

DOE drug free workplace programs.
PRESENTED AT: The DOE and DOE Contractor Environmental Safety and Health Managers Health and Safety Meeting.
Las Vegas, NV, January 27-29, 1993

Eisele, G. R.

Transport of pollutants through man's food chain.
U.S. Department of Energy Traveling Lecture Program, Benedict College
Columbia, SC, February 1, 1993

Fry, S. A.

Biological effects of ionizing radiation.
PRESENTED AT: International Atomic Energy Agency Interregional Training Course.
Argonne, IL, March 29, 1993

Fry, S. A.

Biological effects of ionizing radiation.
PRESENTED AT: Second Regional Congress on Health Physics and Nuclear Safety.
Zacatecas, Mexico, November 23, 1993

Fry, S. A.

Health and mortality studies of Department of Energy facilities workers.
PRESENTED AT: DOE/Radiation Effects Research Foundation Information.
Irvine, CA, April 14, 1993

Fry, S. A.

How risky is it to live in Oak Ridge?
PRESENTED AT: Oak Ridge National Laboratory.
Oak Ridge, TN, January 20-21, 1993

Fry, S. A.

Human radiation exposure experience.
PRESENTED AT: The Medical Effects of Nuclear Weapons Course sponsored by Armed Forces Radiobiology Research Institute.
Bethesda, MD, August 25, 1993

Fry, S. A.

Radiation accidents general overview.
PRESENTED AT: Sub-Regional Workshop on Control of Radiation Safety sponsored by the International Atomic Energy Agency.
Guatemala City, Guatemala, November 16, 1993

Kennedy, D.

Managed care and networking.
PRESENTED AT: The Tennessee Association of Occupational Health Nurses.
Knoxville, TN, October 8, 1993

Littlefield, L. G.

Radioprotective chemicals as tools for studying mechanisms of radiation-induced chromosome damage in human lymphocytes.
PRESENTED AT: The Second International Symposium on Chromosomal Aberrations.
University of Essen, Germany, November 1992

Littlefield, L. G.

Modulation of the clastogenic activity of ionizing radiation and bleomycin by the aminothiols WR-1065.
PRESENTED AT: The Environmental Mutagen Society International Satellite Conference, "The Molecular Basis of Chromosome Aberrations."
Castlemaine, Australia, February 1993

Littlefield, L. G.

Application of fluorescence *in-situ* hybridization techniques in radiation cytogenetics.

PRESENTED AT: The Radiation-Induced Chromosome Changes Symposium at the 41st Annual Meeting of the Radiation Research Society.

Dallas, TX, March, 1993

Littlefield, L. G.

Overview of cytogenetic techniques with a comparison of the usefulness of classical methods for evaluations of translocations vs fluorescence *in-situ* hybridization techniques in detecting chromosome aberrations in exposed workers.

PRESENTED AT: Risk of Leukemia Among Estonian Chernobyl Clean-up Workers Meeting, collaborating international scientists.

Helsinki, Finland, July 1993

Littlefield, L. G.

Cytogenetics Studies in a thorotrast-exposed patient.

PRESENTED AT: NCI workshop on "Cancer Following Exposure to Radioactive Thorotrast."

Rockville, MD, October, 1993

Minner, D. E.

The role of the medical review officer in drug testing.

PRESENTED AT: The 10 CFR 707 Workplace Substance Abuse Programs at DOE Sites Conference.

Las Vegas, NV, April 6, 1993

Minner, D. E.

The safeguards in DOE drug testing.

PRESENTED AT: The 10 CFR 707 Workplace Substance Abuse Programs at DOE Sites Conference.

Las Vegas, NV, April 6, 1993

Minner, D. E.

The prevention of the disability syndrome.

PRESENTED AT: The Westinghouse Medical Seminar.

Atlanta, GA, April 26, 1993

Ricks, R. C.

Pathways of radiation exposure to man; Acute radiation syndrome: diagnosis, prognosis, and treatment; and Localized early radiation injuries and other deterministic effects.

PRESENTED AT: Health Effects of Ionizing Radiation Seminar.

Warsaw, Poland, October 1992

Ricks, R. C.

Follow-up of San Salvador accident patients.

PRESENTED AT: The Second Consensus Development Conference on the Treatment of Radiation Injuries.

Bethesda, MD, April 1993

Ricks, R. C.

Radiation accidents - lessons learned.

PRESENTED AT: The 38th Annual Health Physics Society Meeting.

Atlanta, GA, July 1993

Ricks, R. C.

On scene actions - overview and hospital response.

PRESENTED AT: The Emergency Medical Personnel Radiological Seminar.

Reno, NV, August 1993

Ricks, R. C.

Review of non-reactor accidents and their health consequences.

PRESENTED AT: The IAEA 1993 General Conference - Scientific Session.

Vienna, Austria, September 1993

Ricks, R. C.

The REAC/TS program: Response activities and medical aspects.

PRESENTED AT: The 21st Annual Meeting of Japanese Association for Acute Medicine.

Hiroshima, Japan, November 1993.

Ricks, R. C.

Historical Perspectives of Serious Radiation Accidents: Selected Case Histories.

PRESENTED AT: National Institute of Radiological Sciences. Chiba-shi, Japan, November 1993

Ricks, R. C., Berger, M. E., and Fry, S. A.

Community concerns: Are we failing in risk communication?

PRESENTED AT: The American Occupational Health Conference.

Atlanta, GA, April 1993

Snyder, F.

SEED Traveling Lecture - Mississippi State University

The biochemistry of platelet-activating factor, A potent and diverse biologically active phospholipid.

Starkville, MS, November 18, 1992

Snyder, F.

SEED Traveling Lecture - Georgia State University
Phospholipid analogs as a novel group of membrane-targeted
antitumor agents.
Atlanta, GA, February 21-23, 1993

Snyder, F., Lee, T.-c., and Uemura, Y., and Ou, M.-c.

The role of a novel PAF transacetylase in the biosynthesis of a
diverse group of acetylated lipids.
PRESENTED AT: Third International Conference on Lipid
Mediators in Health and Disease (LMHD).
Jerusalem, Israel, October 31-November 4, 1993

Stabin, M. G.

Fundamentals of radionuclide dosimetry.
PRESENTED AT: American Pharmaceutical Association.
Dallas, TX, March 21, 1993

Stabin, M. G.

Bioassay and internal dosimetry.
PRESENTED AT: Campus Radiation Safety Officers
Conference.
Omaha, NE, June 3, 1993.

Stubbs, J. B.

Treatment planning for pre-targeted Y-90.
PRESENTED AT: NeoRx Corporation.
Seattle, WA, November 18, 1993

Stubbs, J. B.

Compartmental modeling and radiation dosimetry for
the Re-186 NR-LU-10 monoclonal antibody.
PRESENTED AT: NeoRx Corporation.
Seattle, WA, November 17, 1993

Stubbs, J. B.

An overview of radiolabeled monoclonal antibodies.
PRESENTED AT: Hospital of the University of Pennsylvania.
Philadelphia, PA, October 15, 1993

Watson, E. E.

Calculating absorbed dose estimates using the MIRD method.
PRESENTED AT: Florida Pharmaceutical Association.
Orlando, FL, July 10, 1993

COLLABORATIVE RESEARCH

Donna L. Cragle

Health and mortality study of DOE contractor employees.
Hanford Environmental Health Foundation (Richland, WA),
W. Meader; Battelle Pacific Northwest Laboratory (Richland,
WA), E. Gilbert; Los Alamos National Laboratory (Los Alamos,
NM), G. Voelz.

Nancy V. Hicks

A study of the health effects of exposure to elemental mercury:
A follow-up of mercury exposed workers at the Y-12 Plant in
Oak Ridge, Tennessee. Emory University (Atlanta, GA),
Richard Letz.

Ten-ching Lee

Biosynthesis of ether-containing inositol phospholipids.
Department of Biochemistry,
Emory University (Atlanta, GA), Victoria L. Stevens.

Molecular biology aspects of platelet activating factor actions
and metabolism. Environmental Sciences Division, ORNL
(Oak Ridge, TN), Kai-Lin Lee.

Substrate specificities of recombinant cytosolic phospholipase
A₂ high molecular weight. Department of Pediatrics, National
Jewish Center (Denver, CO), Christina Leslie.

Fred L. Snyder

Platelet-activating factor and other bioactive lipids in infants
with respiratory distress syndrome and related disease.
Department of Pediatrics, University of Tennessee (Knoxville,
TN), V. Lorch and M. Gaylord.

Analogues of platelet-activating factor. Department of
Chemistry, Queens College of CUNY, (Flushing, NY),
Robert Bittman.

Analogues of platelet-activating factor. Lederle Laboratories,
(Pearl River, NY), Walter C. Pickett.

Michael G. Stabin

Microdosimetry of aqueous systems containing DNA precursors. Health and Safety Research Division, ORNL (Oak Ridge, TN).

Evelyn E. Watson

Development of mathematical models of the pregnant woman at end of the first, second, and third trimesters. Dosimetry Research Group, ORNL (Oak Ridge, TN).

The Medical Sciences Division (MSD) provides research training for postdoctoral and predoctoral fellows, visiting scientists worldwide, undergraduate students, university faculty, and occasionally high school teachers (students participate in vocational training in some programs).

Formal specialized courses concerning radiation accidents and the medical management of radiation injuries are offered by the Radiation Emergency Assistance Center/Training Site (REAC/TS) for the training of physicians, health physicists, paramedical personnel, attorneys, and other interested individuals. Radiation Internal Dose Information Center (RIDIC) staff members conduct two courses on internal radiation dose calculation and participated in ORISE's Professional Training Programs.

Occasionally, graduate students carry out their doctoral dissertation research under the direction of scientists in our division. These students must meet all of the academic requirements for obtaining the doctoral degree from their own universities. Financial support for graduate studies is generally available from programmatic funds or through individual fellowships sponsored by DOE or other federal and private agencies.

Postdoctoral training continues to be an important part of the division's research efforts. In the past, postdoctoral fellows have been supported by the Damon Runyon-Walter Winchell Cancer Fund, Andrew W. Mellon Foundation, NCI Training Grant (at ORNL), NIH, ACS, the WHO (International Agency

for Research on Cancer), the Fogarty International Center (U.S. Public Health Service), IAEA, Peace Fellowship programs, and MSD programmatic funds.

Some MSD scientists hold adjunct appointments at the University of Tennessee and other ORAU-affiliated universities. In addition to directing graduate student research, some staff members serve on doctoral dissertation committees. Division staff also participate in ORAU professional training and REAC/TS training activities.

The following individuals participated in MSD training programs during 1993:

Postdoctoral Fellows

Ming-che Ou, M.D., Osaka University Medical School, Osaka, Japan (Biochemistry)

Grzegorz Terlecki, Ph.D., Medical School of Wroclaw, Wroclaw, Poland (Biochemistry)

Health Physics Fellows

Jeffrey Evans, Ohio State University, Columbus, OH (RIDIC)

Charleste Olson, Georgia Institute of Technology, Atlanta, GA (RIDIC)

Muffin Harmer, Georgia Institute of Technology, Atlanta, GA (RIDIC)

Karen Colcocci, Rutgers University, New Brunswick, NJ (RIDIC)

Graduate Students

Michael Buley, University of Tennessee, Department of Health Recreation and Leisure (Epidemiology)

Johannah L. Doyle, University of Tennessee, Oak Ridge Graduate School of Biomedical Sciences, ORNL, Oak Ridge, TN (Cytogenetics)

Steven A. Plichta, University of Tennessee, Oak Ridge Graduate School of Biomedical Sciences, ORNL, Oak Ridge, TN (Cytogenetics)

Shimei Xiao, University of Tennessee, Department of Nuclear Engineering, Knoxville, TN (Epidemiology)

Xiaojuan Zhu, University of Tennessee, Department of Health Recreation and Leisure, Knoxville, TN (Epidemiology)

Guest Scientists

Daniel Billen, Ph.D., (emeritus ORAU scientist)

Edgar A. Cress, B.S., (emeritus ORAU scientist)

John R. Totter, Ph.D., (emeritus ORAU scientist)

Alvin M. Weinberg, Ph.D., (emeritus ORAU scientist)

Visiting Scientists

Mary Ann Barnhill, M.S., University of Tennessee School of Veterinary Science, Knoxville, TN (Cytogenetics)

Russ J. DuFrain, Ph.D., Bristol-Myers Co., Syracuse, NY (Cytogenetics)

Teacher Research Associates (TRAC) Participants

Patricia Ann Bradford, Science Teacher, Sumter, SC (Cytogenetics)

Angela E. Meadows, M.S., Rockwood High School, Rockwood, TN (Epidemiology)

Kathleen M. McGarvey, M.A.T., Niceville Senior High School, Niceville, FL (Epidemiology)

Student Research Participants

Travis Archuleta, Emporia State University, Emporia, KS (Biochemistry)

Michael Hassett, Oberlin College, Oberlin, OH (Cytogenetics)

MAJOR AWARDS, HONORS, AND CURRENT APPOINTMENTS

Mary Ellen Berger

Advisor to the Waste Isolation Pilot Plant Medical Working Group, state of New Mexico

Carl J. Blier

Adjunct faculty member for the DOE Central Training Academy

Donna L. Cragle

Adjunct Professor in Arts and Sciences, Pellissippi State Technical Community College, Knoxville, TN

J. Glenn Davis

Assistant Clinical Professor, Department of Community Medicine (Aerospace Medicine), Wright State School of Medicine, Dayton, OH

Adjunct Assistant Professor of Preventive Medicine and Biometrics, F. Edward Hebert School of Medicine, Uniformed Services University of the Health Sciences, Bethesda, MD

Adjunct Associate Professor, Environmental Sciences at the University of Texas School of Public Health, University of Texas Science Center at Houston, Houston, TX

ORAU Representative on the Section Committee of the American Association for the Advancement of Science Sections of Biological Sciences and Medical Sciences

American Medical Association Alternate Representative on the Residency Review Committee for Preventive Medicine

Gerhard R. Eisele

Cochairman of Personnel Security Working Group

Coordinator of the Accelerated Access Authorization Program, drug testing and psychological assessment

Oversight Administrator of the psychological assessment and drug testing components of the Accelerated Access Authorization Program

Shirley A. Fry

Member of the National Council for Radiation Protection and Measurements Scientific Committee Number 57 on Internal Emitters, Task Group Number 15: Uranium (1986 - present)

Member of the Working Group, International Agency for Research on Cancer: Combined Population Studies of Nuclear Industry Workers (1988 - present)

Ten-ching Lee

Adjunct professorship at the University of Tennessee, Oak Ridge Graduate School of Biomedical Sciences, Oak Ridge, TN

Member of NIH Medical Biochemistry Review group (Ad hoc)

L. Gayle Littlefield

Member, National Council for Radiation Protection, Scientific Committee Number 40 on Biological Aspects of Radiation Protection Criteria (1978 - present)

U.S. representative IAEA Coordinated Research Program on Use of Chromosomal Analysis in Radiation Protection (1983 - present)

Editorial Board, *Environmental and Molecular Mutagenesis* (1987 - present)

Adjunct faculty member, University of Tennessee-Oak Ridge Graduate School of Biomedical Sciences (1988 - present)

1990 School of Graduate Studies Alumni Association Distinguished Alumnus, Medical College of Georgia (May 1990)

Member, Joint Coordinating Committee on Civilian Nuclear Reactor Safety (JCCCNRS) Subcommittee 7.2a Biological Dosimetry

Consultant to JCCCNRS Subcommittee 7.2 Leukemia

Member of the Science Advisory Board of the National Center for Toxicological Research, Jefferson, AR (1991 - present)

Environmental Mutagen Society's Biodosimetry Subcommittee (1992 - present)

East Tennessee Chapter of the Association for Women in Science Award for Distinguished and Sustained Scientific Contribution (May 1992)

Councilor of the Environmental Mutagen Society (1993 - 1996)

Alfred F. McFee

Editorial Board of *Mutation Research* (1990 - present)

Robert C. Ricks

Advisor to the Waste Isolation Pilot Plant Medical Working Group, state of New Mexico

Fred L. Snyder

Executive editor of the Editorial Committee for *Archives of Biochemistry and Biophysics*

Member of the Editorial Board of *Lipids*

Member of the Editorial Board of *Biochimica et Biophysica Acta*

Associate editor of *Journal of Lipid Mediators*

Editor of *Handbook of Lipid Research*, A Continuing Series, Plenum Publishing Corporation, New York, NY

Member of the International Advisory Committee for the 5th International Congress on Platelet-Activating Factor and Related Lipid Mediators. Berlin, Germany, September 12-16, 1995

Member of the International Advisory Board Committee, 9th International Conference on Prostaglandins and Related Compounds. Florence, Italy, June 6-10, 1994

Member of the International Advisory Committee for the 3rd International Conference on Eicosanoids and Other Bioactive Lipids in Cancer, Inflammation, and Radiation Injury. Washington D.C., October 12-16, 1993

Member of the International Advisory Board for the International Congresses on Inflammation

Adjunct professorships at the University of North Carolina-Chapel Hill and the University of Tennessee-Oak Ridge Graduate School of Biomedical Sciences, Oak Ridge, TN

Member of the NIH/National Heart, Lung, and Blood Institute (NHLBI) Review Committee, Lipid Pathways and Lung Injury

Michael G. Stabin

President, Medical Section, Health Physics Society, 1993

Member of the American Association of Physicists in Medicine (AAPM) Task Group on Antibody Dosimetry

Corresponding member of the International Commission on Radiological Protection (ICRP) task group on nuclear medicine dosimetry

Associate editor of *Health Physics*

James B. Stubbs

Member of the National Council on Radiation Protection and Measurement (NCRP) Scientific Committee 57-16 on uncertainty associated with the ICRP 30 dosimetry models

Leader of ICRP group reviewing gastrointestinal dosimetry for Reference Man task group

Member, AAPM Task Group on Antibody Dosimetry

Evelyn E. Watson

Lifetime Scientific Achievement award from East Tennessee Chapter Association for Women in Science, 1993

Member of the NCRP Scientific Committee 57-14 on Placental Transfer of Radionuclides

Member of the Society of Nuclear Medicine Medical Internal Radiation Dose (MIRD) Committee

Member, AAPM Task Group on Antibody Dosimetry

Editor, Newsletter, Southeastern Chapter of the Society of Nuclear Medicine

Charles M. West

Working Group, American National Standard Institute (ANSI) N13.22 on Uranium Bioassay Standards

PATENTS AWARDED

None

Non-DOE RESEARCH FUNDING

Donna L. Cragle

Tennessee Quality Improvement Program for the Statewide Tumor Registry and Birth Defects Registry. State of Tennessee Department of Health and Environment. Total costs: \$20,000 (October-December 1993)

Cooperative Agreement for epidemiologic evaluation of childhood leukemia and paternal exposure to ionizing radiation. Battelle Memorial Institute. Total costs: \$16,752

Elizabeth D. Ellis

Case-control study of brain and bladder cancer. ARCO Chemical Company Total costs: \$135,000 (January-December 1993)

L. Gayle Littlefield

Studies of radiation-induced chromosome damage in humans. NCI-DOE interagency agreement. Total costs: \$96,000

Cytogenetic indices direct vs indirect radiation action. R01 Grant. Total costs: \$208,485

Alfred F. McFee

Evaluation and application of an *in-vivo* mouse assay for chemically induced sister chromatid exchanges and chromosome aberrations. NIEHS-DOE Interagency agreement. Total costs: \$ 357,686

Fred L. Snyder

Metabolism, regulation and function of ether lipids in cancer cells; phospholipid mediators and their antitumor analogs. ACS. Total Grant Period: January 1992 - December 1993, Direct Costs: \$177,000 Indirect Costs: \$59,000. Current Grant Period: January 1 - December 31, 1993, Direct Costs: \$94,400 Indirect Costs: \$23,600

A novel class of biologically active phospholipids. NHLBI. Total Grant Period: January 1992 - November 1995, Direct Costs: \$474,987 Indirect Costs: \$336,916. Current Grant Year: December 1, 1992 - November 30, 1993 Direct Costs: \$116,325 Indirect Costs: \$79,334

An antihypertensive class of neutral lipids in kidney. NHLBI. Total Grant Period: July 1991 - June 1994, Direct Costs: \$413,343 Indirect Costs: \$281,900. Current Grant Year: July 1993 - June 1994, Direct Costs: \$145,354 Indirect Costs: \$89,247

Dietary ether-linked lipids and n-3 fatty acids. NIH. Total Grant Period: May 1991 - April 1994, Direct Costs: \$301,860 Indirect Costs: \$189,870. Current Grant Year: May 1993 - April 1994, Direct Costs: \$104,525 Indirect Costs: \$64,178

Evelyn E. Watson

Interagency agreement with the FDA for the internal dose center to provide radiation dose information to radiopharmaceutical users and others and to conduct research to improve accuracy of dose estimates. October 1992 - September 1993 (continuing). Total Costs: \$174,000

Interagency agreement with the NRC for the internal dose center to provide radiation dose information in response to requests concerning misadministrations of radiopharmaceuticals and related topics and conduct research to improve accuracy of dose estimates. October 1992 - September 1993 (continuing). Total Costs: \$100,000

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*Part-time temporary

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Susan Moody (CER)
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Teresa Pyles (CER)
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 John H. Spickard, M.D., M.P.H., FACOEM, medical director,
 Lawrence Livermore National Laboratory, Livermore, CA
 Myint Thein, Ph.D., section head, Radiation Dosimetry and
 Records Section, ORNL, Oak Ridge, TN
 George L. Voelz, M.D., technical expert, assistant division
 leader, Health Research, Los Alamos National
 Laboratory, Los Alamos, NM
 Niel Wald, M.D., professor, Environment & Occupational
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 of Pittsburgh, Pittsburgh, PA
 Jim Watts, Ph.D., supervisor, Whole Body Counting
 Laboratory, ORNL, Oak Ridge, TN
 Steven L. Wyatt, B.S., Public Information Office, DOE,
 Oak Ridge, TN

ABBREVIATION KEY

ADM	Administration
CER	Center for Epidemiologic Research
CHRS	Center for Human Reliability Studies
CYTO	Cytogenetics
EP	Emergency Preparedness
FS	Facility Safety
OM	Occupational Medicine
REAC/TS	Radiation Emergency Assistance Center/ Training Site
RIDIC	Radiation Internal Dose Information
RM	Radiation Medicine
TA	Technical Assistant

ADMINISTRATION AND COMMITTEES

OFFICERS OF THE CORPORATION

Anthony Randazzo, Ph.D., University of Florida, board chair
 Kenneth M. Pruitt, Ph.D., University of Alabama at
 Birmingham, council chair
 Jon M. Veigel, Ph.D., ORAU, president and treasurer
 Ann H. Patton, B.S., ORAU, secretary

BIOMEDICAL ADVISORY COMMITTEE

John Papaconstantinou, Ph.D., University of Texas Medical Branch (chairperson)
Victor P. Bond, M.D., Ph.D., Brookhaven National Laboratory
Roy L. DeHart, M.D., University of Oklahoma Health Sciences Center (board liaison)
John M. Johnston, Ph.D., University of Texas Health Science Center
Roy Shore, Ph.D., New York University Medical Center
Arthur A. Spector, M.D., chairman, University of Iowa

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Harland Austin, D.Sc., Emory University
Theodore R. Holford, Ph.D., Yale University of Medicine
Roy E. Shore, Ph.D., D.P.H., New York University Medical Center
Allan H. Smith, M.D., Ph.D., University of California

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Roy L. DeHart, M.D., University of Oklahoma Health Sciences Center (board liaison)
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Diane M. Jacobs, Ph.D., East Carolina University
O. Ray Kling, Ph.D., University of Oklahoma
H. Peter Lehmann, Ph.D., Louisiana State University Medical Center
William B. Lushbaugh, Ph.D., University of Mississippi Medical Center
Ernest A. Turner, M.D., Meharry Medical School
K. Lemone Yielding, M.D., University of Texas (vice chairperson)

COMMITTEE ON HUMAN STUDIES

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J. Glenn Davis, M.D., M.P.H., ORISE
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