



A REPORT TO THE PHYSICIANS OF TEXAS

newsletter



THE UNIVERSITY OF TEXAS SYSTEM CANCER CENTER

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M. D. Anderson Hospital and Tumor Institute

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New Findings Alter Genetic Theory

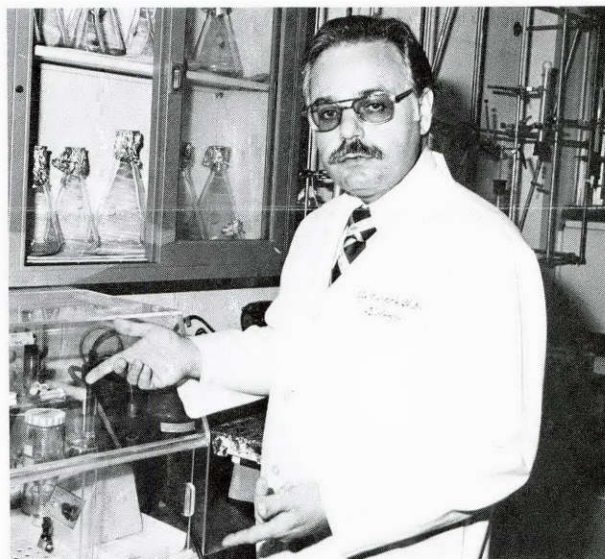
Emanuel J. Murgola, PhD, Department of Molecular Biology, recently participated in an international workshop on transfer RNA (tRNA) sponsored by the European Molecular Biology Organization and the Federation of European Biochemical Societies. Findings brought to light during the week-long workshop have altered some of the long-held theories about the nature of the genetic code.

Approximately 150 scientists met in Strasbourg, France, to discuss the structure, function, biosynthesis, and gene organization of tRNA. Dr Murgola was invited to the workshop as a lecturer and round-table discussion organizer. He spoke on the topic, "Codon Recognition by Normal and Mutant Transfer RNAs."

According to Dr Murgola, the most important conclusion to come out of the workshop is that the genetic code is not as fixed as it was once thought to be. He says, "The genetic code was once thought to be universal, but this clearly is not the case. It was thought that all tRNAs were identical in structure, but now we know that not all tRNAs look alike. They're not all the textbook type."

Dr Murgola explains that the universality theory was shaken when unusual codon (code word) specificities and tRNA structures were found in mitochondria and among mutants of cytoplasmic tRNAs. "The code is not entirely universal, even in a particular kind of cell or tissue," Dr Murgola says. "In one cell there can be two codes operating."

Another conclusion to come out of the workshop is that the recognition of codons is not explained simply by the classical rules of hydrogen bonding. The old theory, Dr Murgola explains, was that "decoding" took place through hydrogen bonding between complementary, antiparallel trinucleotides in tRNA



Emanuel J. Murgola, PhD, explains some of the recent discoveries about tRNA and their potential medical applications.

and messenger RNA (mRNA) or, more specifically, between the codon in mRNA and the anticodon in tRNA. However, data presented at the workshop, much of which was the work of Dr Murgola and other MDAH researchers, demonstrated the existence of unorthodox codon responses of normal and mutant tRNAs.

According to Dr Murgola, these findings will have far-reaching effects on our understanding of the genetic code and on our

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MDAH to Test Marijuana as an Antiemetic

Following the federal government's recent announcement of a nationwide protocol for the medical use of tetrahydrocannabinol (THC), MDAH physicians may now prescribe the substance as an antiemetic for certain patients undergoing chemotherapy. Fred Conrad, MD, vice president for patient care, explained the medical applications of marijuana and the details of the new protocol in a lecture at MDAH, "Marijuana and Medicine," prior to the official announcement of the substance's approval.

A member of the Texas committee appointed to draw up an earlier state protocol, Dr Conrad has been active in the state's attempt to gain federal approval for Texas physicians to use marijuana in medical treatment. He first explained that officially marijuana is still a Schedule I drug, "with the potential for abuse and no medical application," according to the Federal Food and

Drug Administration (FDA). However, he said that THC, the active principle in marijuana, may soon be upgraded to a Schedule II drug.

According to Dr Conrad, the most promising of marijuana's potential medical applications is its use as an antiemetic or antinausea agent. Experiments have shown that marijuana is comparable to the popular antinausea drug, Compazine. Investigators have obtained a 40-65% response rate with marijuana, compared with the 32% found with Compazine. Given orally before chemotherapy, marijuana can decrease the number of emetic episodes and their duration and volume. Blood levels of 5-10 ng give a 21% response rate, whereas levels greater than 10 ng increase the rate to 44%. Higher blood levels are obtained through smoking the substance than through oral

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Katherine Crosson, MPH, director of the Patient Education Program, and **Fred Conrad, MD**, vice president for patient care, examine several of the pamphlets available to patients and their families in the patient education literature racks throughout the hospital and clinics (left). The Pediatric Learning Resource Center offers parents of pediatric patients reference materials designed to educate them about their child's disease and help them participate in the child's care (right).



Educational Activities Aid Patients, Families

When MDAH established its Patient Education Program in September of 1979, it became the first comprehensive cancer center in the country to establish a formal program to plan, coordinate, implement, and evaluate patient education activities. As the program enters its second year, there is visible evidence of its contributions to patient care in the recent opening of the Pediatric Learning Resource Center, completion of *A Handbook for Parents of Pediatric Patients*, and installation of patient education literature racks throughout the hospital and clinics.

The Pediatric Learning Resource Center (PLRC) was officially opened in a ribbon-cutting ceremony November 6. The center was established to provide current and accurate information to parents and relatives on a self-referral basis, according to Katherine Crosson, MPH, director of the Patient Education Program.

The educational materials available in the PLRC have been reviewed and approved by physicians, nurses, other health professionals, educators, and the parents of pediatric patients. They were chosen with the special needs of pediatric patients' parents in mind, covering topics from diagnostic procedures,

treatment, and potential for cure to nutrition, parenting, child development, coping, and death and dying.

A Handbook for Parents of Pediatric Patients has been developed to introduce and welcome parents to the Pediatric Clinic. The handbook provides an overview of the pediatric patient care staff and the oncology services by explaining the diagnostic procedures, treatments, and protocols used and by describing the childhood cancers seen at MDAH. Special emphasis is placed on the parents' participation in their child's care. In the future, the Patient Education Program plans to expand the PLRC facility to include educational films and slide/tape presentations.

A similar project, with a broader application to all MDAH patients, is the recent installation of 30 patient education literature racks. With the understanding that knowledgeable patients can participate more effectively in their treatment and rehabilitation, the Patient Education Program has made the literature racks an integral part of the educational activities at MDAH. Located in all clinic station waiting areas and inpatient reception areas, the literature racks offer 40 approved educational pamphlets produced primarily by the National Cancer Institute and the American Cancer Society.

According to Ms Crosson, the literature racks have been well received. She says, "We've had an overwhelming response from both patients and staff. People who have come here for years have said the pamphlets helped them understand their disease better." Relatives, too, have welcomed the pamphlets, she says, because the information helps them understand the patient's cancer and educates them about the possible cancer risks they may face.

MDAH's commitment to these educational activities and to the idea of planned patient education is an outgrowth in part from a growing recognition nationwide that patient education can enhance the quality of patient care. In 1975, the American Medical Association (AMA), in a position statement on patient education, recognized the role that the patient's attitude,

newsletter

Head, Department of Scientific Publications: Dorothy M. Beane. Editor: Marianne Warfield. Art and Photography: Department of Medical Communication.

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lifestyle, and cooperation play in the treatment process and acknowledged that well-informed patients and their families can aid in the recovery and improve the health of the individual. The AMA cited further benefits of patient education programs as the potential to reduce the use of health care facilities, improved patient morale, shortened recovery time, and cost containment.

Although the idea of planned patient education is a relatively new one, patient education has always been an important, but informal, part of patient care at MDAH. Until the establishment of the Patient Education Program, individual members of the health care team provided informal assistance to patients who wanted to know more about their disease. Physicians, nurses, pharmacists, occupational and physical therapists, dietitians, social workers, chaplains, and volunteers responded independently to the patient's need for information. Printed materials were available from various sources such as the Cancer Information Service and the Department of Public Information and Education, but these educational resources were managed and provided independently, without the benefit of a hospital-wide coordination of activities.

In June 1979, MDAH took the first step toward formalizing patient education when Robert C. Hickey, MD, executive vice president, established a patient education committee to develop an institution-wide program. Three months later, a formal Patient Education Program was created within the Office of the Vice President for Patient Care, and a full-time staff was appointed to assess MDAH's patient education needs and develop programs to meet those needs. Under the direction of Ms Crosson and with the assistance of Pamela Jeffries, health education specialist, the program is designed to establish institutional policies and procedures to meet the educational needs of MDAH patients through all stages of disease, from diagnosis to rehabilitation to continuing care.

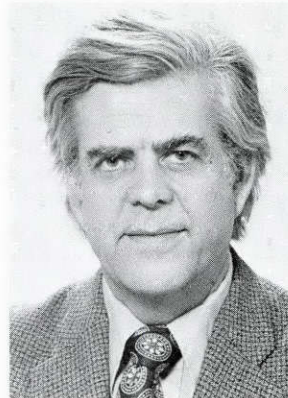
Ms Crosson came to the MDAH program from the Fox Chase Cancer Center in Philadelphia, where she was their health education specialist. She made the move, she says, because of the challenge of developing and implementing a patient education program of this size.

"The importance of administrative backing cannot be over-emphasized," she says. "There is a recognition here that patient education is an integral part of patient care."

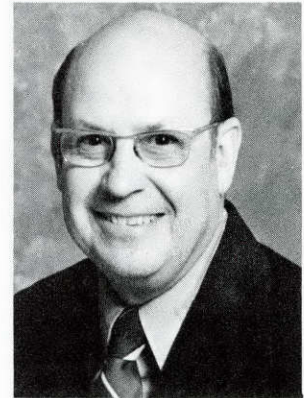
Second Pharmacy Symposium Held

The Department of Pharmacy held its Second Annual Pharmacy Symposium October 2-3 at Houston's Shamrock Hilton Hotel. This year's topic, "Cancer Chemotherapy," focused on the chemotherapeutic treatment of cancer and management of the disease's complications.

Physicians and nurses, as well as pharmacists, participated in the symposium, addressing topics as broad as interferon, blood component therapy, pain and infection management, ostomy care, chemotherapy treatment of testicular cancer, intra-arterial administration of chemotherapy, an immunotherapy update, and an overview of pediatric oncology. Workshops and "curbside consultations" allowed attendees to observe and discuss the role and responsibilities of the hospital pharmacist in an oncology institution and to learn more about chemother-



Jan van Eys, MD, PhD



Robert D. Moreton, MD

Noteworthy

Jan van Eys, MD, PhD, head of the Department of Pediatrics, has received two recent appointments. He began a one-year term as chairman of the Graduate Faculty of The University of Texas Health Science Center Graduate School of Biomedical Sciences in September, and was voted president-elect of the Houston Academy of Pediatrics.

Robert D. Moreton, MD, vice president for patient affairs, was honored by the Texas Board of Health at a surprise luncheon in Austin. The luncheon was held in appreciation of Dr Moreton's five years of service as chairman of the Board. Over 50 Board members, members of the Texas Department of Health, and other friends attended the luncheon. Dr Moreton was presented an original oil painting and the gavel he used as chairman from 1975 to 1980.

R. E. Post, RPh, has been appointed to the Texas State Board of Pharmacy. Mr Post was appointed by Texas Governor William Clements to complete an unexpired term on the six-member Board. The State Board of Pharmacy enforces the Pharmacy Practice Act of Texas, and as a member of the Board, Mr Post will hear violation cases and conduct licensure examinations of prospective pharmacists.

apy preparation and dispensing, management of side effects and toxicity, and preparing and monitoring hyperalimentation.

Faculty from MDAH were Victor Fainstein, MD, Jeane P. Hester, MD, Jorge R. Quesada, MD, and Susan Johnston, RN, of the Department of Developmental Therapeutics; Melvin Samuels, MD, Department of Medicine; Norman Jaffe, MD, Department of Pediatrics; and Dot Rodriguez, RN, Department of Nursing. Clarence Fortner, MS, RPh, of the Baltimore Cancer Research Center and Patricia Wojcik, PharmD, from St. Johns Hospital in Springfield, Illinois, also spoke.

William J. Dana, PharmD, RPh, and R. E. Post, RPh, were the program directors. The symposium met the criteria for 12 hours in Category I of the Physician's Recognition Award of the American Medical Association.

MDAH Offers Oncology Nursing Program

In September eight nurses entered MDAH's first Oncology Nurse Clinician program, according to Joyce Alt, RN, MSN, director of the Department of Nursing. This pilot program is designed to provide a broad overview of cancer nursing and specialized education in the different types of cancer through a work-study curriculum.

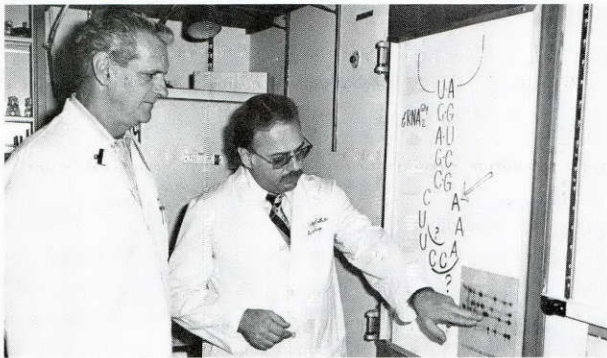
One of the few long-term continuing education programs in the country that is focused on oncology, the MDAH program seeks to provide formal oncology training that will enable nurses to work more effectively not only in a comprehensive cancer center, but in the community at large. The two-part curriculum begins with an introduction to the disease and cancer nursing in general. In the second part, students will take a module on the cancers associated with a different body system each month, during which time they will practice that aspect of cancer nursing. Upon graduation from the 11-month course, nurses should be able to assist in establishing services for and provide direct nursing care services to oncology patients in a variety of settings, such as community clinics, comprehensive cancer centers, hospitals, and physicians' offices.

According to Ms Alt, the program arose from the medical community's need for nurses with oncology preparation and from MDAH staff nurses' desire for more formalized education in cancer care. Ms Alt reports that preliminary studies conducted prior to the establishment of the program found that Texas nurses at all career levels wanted information on cancer nursing beyond what is offered in basic nursing education. Nurses responding to an MDAH survey sent to 422 Texas hospitals reported that continuing education related to cancer nursing

was rarely to occasionally available, and they expressed a desire for programs covering acute, terminal, home, and intermediate care; the nursing implications of various types of treatment (chemotherapy, immunotherapy, and radiotherapy); rehabilitation; body image adaptation; nutrition; and discharge planning. More than 90% of those responding listed coping with the stress of caring for the cancer patient as a topic they would like to see addressed. MDAH nurses reported that, because of limited access to cancer education in traditional nursing training and because much of their information is gained through assimilation, a formal cancer education program was needed.

According to Ms Alt, this desire for information on cancer is universal, since cancer patients are encountered in all hospital settings, but there are very few sources that provide oncology information to nurses who desire it. She says that the MDAH Department of Nursing receives at least 30 requests each month for assistance in continuing education in cancer nursing. Requests for site visits to MDAH, speakers for symposia, and answers to questions about cancer care are common. Even with the little publicity given the new MDAH program, the department received 77 applications from nurses in 24 states. One of the department's goals, Ms Alt says, is that MDAH one day will have a standard curriculum with regular program offerings. Although no degree is offered, the program has obtained American Nurses' Association approval to grant continuing education units.

Because this first Oncology Nurse Clinician program is a pilot



Dr Murgola and Norman E. Prather, PhD, examine a diagram and chromatogram of a mutant tRNA in which an extra nucleotide has been inserted in the anticodon loop.

tRNA...

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"ability to insert ourselves into the process."

"We now know that recognition of codons involves the conformation of the tRNA," he explains. "Its conformation is important for fidelity in the decoding process."

He explains that fidelity in the code, or the faithful expression of genetic information that results in the formation of "normal"

cells, tissues, and organisms, involves interactions of tRNA, ribosomes, and mRNA. These interactions, in turn, require specific conformational attributes and conformational changes. Since the conformation of tRNA is partly dictated by its chemical structure and partly by changes in its intracellular and extracellular environment, the scientist can participate in the genetic process by altering the molecular environment and by making structural modifications of the tRNA or the molecules with which it interacts.

The potential applications of this knowledge are immense, according to Dr Murgola. Among the most promising uses of this ability to alter the translational fidelity of tRNA are "tRNA therapy" and "gene therapy." Dr Murgola says that such applications are important goals for scientists working with tRNA.

Looking to the future of tRNA research, he says, "In cases where there has been an alteration in the fidelity of expression of genetic information, such as in certain diseases, we may be able, through gene therapy, to reverse the infidelity, or, with tRNA therapy, to suppress the detrimental effects of the misinformation."

A particular and immediate value of the information presented at the workshop, Dr Murgola concludes, is the emergence of a framework for understanding the nature and meaning of very specific tRNA alterations that are induced by interferon and other related drugs.

study, only one of the students is from an institution other than MDAH. Future programs, however, will seek an enrollment of 50% MDAH employees and 50% from other hospitals in Texas and from around the country. Selected MDAH employees can participate in the program tuition-free as part of their employment. Students will pay only for textbooks and educational materials, says Ms Alt, explaining that "we are looking for a workforce gain, not a monetary one."

A related benefit the Department of Nursing hopes to gain from the program is a greater retention of nursing staff. "Continuing education is a major factor in recruiting and retaining nurses," she says. "Nurses stay because they have the

potential to graduate to a higher level in our career ladder program." Coping with stress, too, will be emphasized in the program, and this should result in more nurses' choosing to remain in an acute care setting, she says. "Helping nurses integrate their value systems into this setting is an essential part of the program," Ms Alt explains. "We want them to develop the knowledge and skills that will enable them to feel comfortable in an oncology situation."

The MDAH Oncology Nurse Clinician program will continue until August 1981. The Department of Nursing will be evaluating the educational approach and the overall effectiveness of the pilot program during this time.

Muscle-Skin Flaps Aid Rapid Rehabilitation

Discoveries made in the last few years about the reconstructive possibilities of musculocutaneous "flaps" are contributing to the rapid rehabilitation of many MDAH patients.

Although the use of a muscle-skin flap to repair a chest wall defect was reported as early as 1896 and multistage reconstruction has been performed with skin flaps throughout this century, the technique of taking a flap of muscle and skin from one part of the patient's body and moving it to another to fill in a defect was not rediscovered until the late 1970s. In the last three years, a new understanding about the discrete vascular anatomy of skin and muscle has allowed reconstructive surgeons to include the vessels underlying the muscle in the flap. According to David L. Larson, MD, Department of Head and Neck Surgery, this new knowledge has revolutionized reconstructive techniques.

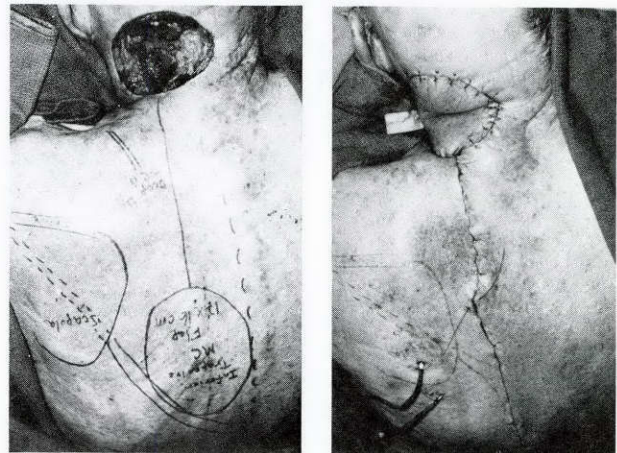
Dr Larson, who came to MDAH in 1978 and initiated the use of musculocutaneous flaps here, explains some of the problems encountered in reconstructive surgery and traces the history of the new technique.

"Our goal is always the total rehabilitation of the cancer patient. After the disease has been treated, we want to return the patient to society. This rehabilitation is particularly difficult in head and neck patients," he says, "because that area of the body is always so visible."

"In the 1930s and 40s, the patient had to wait three to five years to see if the cancer recurred before any reconstruction was undertaken," he says. "And this often made the patient a recluse while waiting for the reconstruction."

"Then," he continues, "in the 60s and 70s, immediate reconstruction came into being, but it was often an elaborate, multistage procedure. A flap was removed, usually from the chest or forehead, and grafted to one location first and then moved to the site of the defect later, sometimes after many operations. It was often months and many hospitalizations before the patient was rehabilitated."

"We then discovered something that changed all that," he explains. "About three years ago, a very simple fact was discovered—that a flap could be made with a muscle and the overlying skin and it could be rotated on a single vascular pedicle. This is the musculocutaneous flap. The technique allows a one-stage reconstruction of the defect and the immediate rehabilitation of the patient, usually during one hospital stay. It revolutionized reconstructive surgery."



Photographs of a patient before and after a one-stage reconstruction of a resection defect. Left: The area indicated by the circle and the markings extending from the defect will be elevated and the muscle-skin flap positioned over the wound. Right: The flap is in place, and the donor site has been closed.

According to Dr Larson, the advantages of these flaps are great and the complications surprisingly few. The flaps are readily available, provide enough skin and muscle to correct large defects, and permit the reconstruction to be performed during the initial cancer resection. Donor site morbidity is minimal, and there is usually no need for skin grafts since most of the donor sites can be closed by advancing the surrounding skin. An important advantage is that the flaps can be used on patients who have had prior surgery or irradiation or both.

Disadvantages relate to flap viability and loss of muscle function. "Some of our flaps have not been viable," Dr Larson says, "but that's not common. And loss of muscle function is not that big a problem because the function is usually taken over by other synergistic muscles."

Dr Larson is enthusiastic about the future applications of flaps to cancer patient rehabilitation and about the effects the new techniques have had on patients at MDAH. "With the use of musculocutaneous flaps, we've found that the hospital stay is shortened and the rehabilitation more rapid," he says.

Concerning the potential contributions of musculocutaneous flaps, he says, "We are continuing to look for new uses for these flaps. Their use is limited only by the imagination of the surgeon and the blood supply of the muscles of the body."



Clifton D. Howe, MD

Clifton D. Howe Dies

Clifton D. Howe, MD, died October 1 of cancer at the age of 66. A member of the MDAH staff from 1948 until his retirement in 1977, Dr Howe served the institution as internist, chief of clinics, associate director of clinics, and associate director of hospitals. He became the first head of the Department of Medicine in 1959 and is credited with shaping what was a loosely organized unit into a specialized department.

Dr Howe was one of the first internists in the U.S. to devote his career to full-time cancer patient treatment. In his treatment of cancer patients, he insisted that the patient's total health and any other medical problems be considered. He coauthored the book, *Cancer Patient Care at M.D. Anderson Hospital and Tumor Institute*, which explains MDAH's multidisciplinary approach to cancer treatment, with R. Lee Clark, MD, now president emeritus, in 1976. He continued to serve MDAH after his retirement, retaining a third of his regular work load at the hospital.

Dr Howe was a member of more than 20 medical and scientific societies. He was active in several of these societies on the local level, serving as vice president of the Houston Society of Internal Medicine, as a member of the board of directors of the Harris County Unit, Texas Division, of the American Cancer Society, and as a member of the public relations board and the nominating committee of the Harris County Medical Society.

At memorial services held for Dr Howe, Robert C. Hickey, MD, and C. C. Shullenger, MD, representing the MDAH staff, paid tribute to him with their personal and professional remembrances. They said he will be remembered by his friends and colleagues as a "keen, astute physician" who was willing to "take more heat and pressure than he ever gave out" and as a man of "irrepressible humor," whose presence at MDAH will be greatly missed.

Dr Howe is survived by his wife, Eleanor, and five children. A Clifton D. Howe Memorial Fund has been established in his honor.

Scientific Abstracts

J. Meyne, L. H. Lockhart, and F. E. Arrighi: "Nonrandom Distribution of Chromosomal Aberrations Induced by Three Chemicals"

The G-band locations of 3244 breakpoints induced by cisplatinum (II) diamminedichloride, 1460 breakpoints induced by cytosine arabinoside (ara-C), and 1257 breakpoints induced by triethylenemelamine in human lymphocyte chromosomes were identified. The breakpoints induced by each of these chemicals demonstrated a significantly nonrandom distribution within the human karyotype. The overall pattern of the interarm distribution was dependent upon the chemical used, but certain chromosome arms exhibited similar responses to all three chemicals. Comparison of the frequencies of breakpoints within individual G-bands indicated that (1) certain bands were susceptible to damage induced by all three chemicals, (2) certain bands were resistant to damage by all three chemicals, (3) certain bands demonstrated variable susceptibility to induced damage dependent upon the chemical agent, and (4) other bands demonstrated near-expected frequencies of damage (by length) to all three agents (*Mutat Res* 63:201-209, 1979)

L. Hens, M. Kirsch-Volders, F. E. Arrighi, and C. Susanne: "Relationship Between Measured Chromosome Distribution Parameters and Ag-Staining of the Nucleolus Organizer Regions"

Trypsin-banded metaphase plates provided by one whole blood culture of a normal adult female were analyzed for the chromosome distribution by measuring: (1) distances between centromeres; (2) angles formed between a centromere, the gravity center of the metaphase plane, and a second centromere; and (3) the measured "tendency to associate," as defined by Galperin in 1969. These data are correlated with silver nucleolus organizer regions (Ag-NOR) staining findings obtained for 72 cells from another culture of the same individual. In these cells, the chromosome pairs are identified using a simultaneous Ag-NOR staining and acridine orange banding technique. The silver precipitation is also correlated with the scored satellite associations in these cells. The results show a correlation between all concerned parameters, indicating that the nucleolar function of the human acrocentric chromosomes, as demonstrated by the silver precipitation technique, is probably one of the major determinants of the proximity of these chromosomes. There is a pronounced correlation of the Ag-NOR findings with those measured parameters that describe best the preferential small distances between chromosomes (angle analysis and "tendency to associate" data). Moreover, the association patterns of the acrocentrics with small amounts of NOR provide some evidence for the interference of other determinants cogoverning the position of the human D- and G-group chromosomes (*Hum Genet* 53:363-370, 1980).

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Marijuana. . .

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ingestion, he reported.

Physicians have found marijuana to be useful in treating wide-angle glaucoma, as well. According to Dr Conrad, marijuana is better than atropine in managing this type of glaucoma, decreasing intraocular pressure up to 45%, but it does cause hyperemia of the eyes. In glaucoma treatment, the substance is inhaled, taken orally, or applied locally on the eye.

Investigators have used marijuana to treat several other conditions with less success. Marijuana is equal to Isuprel as a treatment for asthma, bringing about immediate bronchodilation in 90% of patients. However, it can cause irritation and long-term detrimental effects such as bronchiolitis. As an analgesic, marijuana is comparable to codeine (10 mg marijuana = 60 mg codeine), but it causes a 30% increase in pulse rate and causes blood pressure to drop. In tests using marijuana to treat epilepsy and anxiety, it was found to have no medical benefit.

Marijuana does have some side effects, according to Dr Conrad. He listed these as dysphoria, psychomotor impairment, headache, passivity and lack of motivation, and emphysema. Chromosome breakage and diminished testosterone production have also been reported, but according to Dr Conrad, the results are questionable and are being reexamined. Concerning dysphoria, Dr Conrad said that older patients, and particularly ones who do not drink alcohol, have more problems than do younger patients and can experience anxiety, paranoia, depression, and disorientation.

Dr Conrad then traced the recent history of marijuana's use in medicine and the subsequent development of a national protocol. Prior to the new "umbrella" protocol, he explained, each state had to draft a document requesting permission for its physicians to use marijuana in treatment and then submit it to the federal government. Texas was in the process of drafting such a protocol when it was announced that a national protocol was forthcoming.

The subsequent approval of this protocol has simplified the process of gaining approval to use marijuana in medicine considerably, he said, remarking that "the FDA is making it as simple as possible." Under the new protocol, he explained, the National Cancer Institute (NCI), the Drug Enforcement Agency (DEA), and the FDA will approve the pharmacy's application to dispense marijuana. Physicians wishing to prescribe marijuana fill out a form and submit it to their pharmacy, which in turn sends the form to NCI. About one week later, NCI approves the request and returns the form to the pharmacy. The physician then writes a prescription for up to 25 2.5-mg or 5.0-mg capsules.

Patients must sign a consent form, acknowledging that they are aware that the drug is experimental and that they have been told about possible side effects. Additionally, in Texas, physicians must submit one more form to the Texas Department of Health, attesting that their use of marijuana meets the following criteria: the patient is undergoing chemotherapy, he or she is having side effects, and these side effects are unrelieved by traditional drugs.

Some questions remain unanswered, according to Dr Conrad. Most relate to legal matters concerning the patient's right to carry marijuana. He said that the Texas Department of Health is looking into these matters, but as yet, patients do not have clearance to carry the drug. Additionally, since each state decides whether it will allow its physicians to use marijuana in treatment, there is also the question of what might happen to a patient who is treated at a hospital in Texas and then returns home to a state that has not legalized the drug's medical use.

Despite these questions, Texas physicians now have the option of using what appears to be an effective antiemetic agent in approved hospital settings and with a minimal amount of red tape. MDAH physicians will be testing this controversial drug's effectiveness in managing one of the most prevalent side effects of chemotherapy.

34th Annual Symposium on Fundamental Cancer Research

Molecular Interrelations of Nutrition and Cancer

March 4-6, 1981

Shamrock Hilton Hotel, Houston, Texas

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In Cooperation with The University of Texas
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of Biomedical Sciences

Cochairpersons: Marilyn S. Arnott,* PhD, Jan van Eys, MD, PhD, and Yeu-Ming Wang, PhD, Departments of Pediatrics and *Biology.

As an organization accredited for continuing medical education, The University of Texas System Cancer Center M. D. Anderson Hospital and Tumor Institute certifies that this medical education offering meets the criteria for 16 credit hours in Category I of the Physician's Recognition Award of the American Medical Association. For further information, contact Yeu-Ming Wang, PhD, Department of Pediatrics, M. D. Anderson Hospital and Tumor Institute, 6723 Bertner Avenue, Houston, Texas 77030.



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Biomedical Electronics Lab Maintains, Fixes Equipment

In an effort to guarantee medical electronic equipment's serviceability or immediate repair, MDAH created the biomedical electronics laboratory, a four-man team that is "on-call" 24 hours a day to repair critical equipment. The technicians' ability to respond rapidly and the lower cost of in-house maintenance and repair were primary factors in creating the laboratory in the Physical Plant.

Since its formation a year ago, the lab has seen its work load multiply. "We expected to work into things gradually, taking over maintenance as warranties and service contracts ran out," Al Hernandez, head of the laboratory, says. "But now, in less than a year, we are responsible for all medical equipment in the patient care areas with few exceptions." Those areas, the

operating rooms, and intensive care units have over 5000 pieces of electronic equipment.

The technicians spend about one fourth of their time in the operating rooms or intensive care units. In the operating rooms, they run last-minute checks on equipment to make sure it is working properly.

Researching the market for equipment to fill specific needs, inspecting sample equipment for quality and suitability before it is purchased, and evaluating and inspecting all new equipment are all part of the biomedical electrician's job.

According to Hernandez, the group will eventually be responsible for all laboratory electronic equipment as well.

Scientific Abstracts. . .

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T. G. Cleary, L. K. Pickering, W. G. Kramer, S. Culbert, L. S. Frankel, and S. Kohl: "Amikacin Pharmacokinetics in Pediatric Patients With Malignancy"

The pharmacokinetics of amikacin were evaluated in 50 pediatric patients (1 to 17 years of age) with malignancies and normal renal function. Dosage regimens of 5 mg/kg per dose were administered intravenously (1) over 30 minutes every eight hours, (2) over 60 minutes every eight hours, and (3) over 60 minutes every six hours. Administration of amikacin over 30 minutes produced concentrations in serum of $29.3 \pm 5.7 \mu\text{g/ml}$ at the end of the infusion and subtherapeutic concentrations four hours after the infusion. The regimen of 20 mg/kg/24 hours, divided into doses given every six hours infused over 60 minutes, achieved concentrations in serum at the end of the infusion of $17.2 \pm 1.7 \mu\text{g/ml}$ and at six hours of $1.2 \pm 0.3 \mu\text{g/ml}$. The serum half-life was 1.24 ± 0.09 hours, volume of distribution was 0.26 ± 0.02 liter/kg, and total body clearance rate was 131 ± 10 ml/min/1.73 m². No accumulation of amikacin was

noted, and no significant side effects could be attributed to the drug. This study suggests that the optimal initial dosage regimen of amikacin in children is 20 mg/kg/24 hours administered in equal doses every six hours over 60 minutes; however, optimal therapy requires individualization of dosage based on measured serum concentrations and susceptibility data on bacterial pathogens isolated (*Antimicrob Agents Chemother* 16:829-832, 1979).

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