ACRH-105

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Meeting of the Bio-Medical Program Directors of the United States Atomic Energy Commission

FEBRUARY 12–13, 1968

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USAEC BIO-MEDICAL PROGRAM DIRECTORS' MEETING

Argonne Cancer Research Hospital
University of Chicago

Alexander Gottschalk, Director

February 12-13, 1968

P R O G R A M*

Monday, February 12

9:00 A.M.	Introductory Remarks Leon O. Jacobson, Dean Division of the Biological Sciences
Morning Session	Stanley Yachnin, Chairman
9:05	Lipoprotein Metabolism of Cell Membranes Alvin R. Tarlov (pp. 58-59)
	Chromosome Studies in Pre-leukemia Janet Rowley (pp. 63-64)
	Study of Human Bone Marrow *in vitro* Sanford B. Krantz (pp. 61-62)
10:25	INTERMISSION
10:40	Metabolism and Pharmacological Effects of Lithocholic Acid Robert H. Palmer (p. 74)
	A Factor from *Escherichia coli* Required for the *in vitro* Enzymatic Synthesis of the Ø X 174 Replicative Form of Phage DNA Mehran Goulian (p. 95)
	Cellular Events During Primary Immune Response *in vitro* and *in vivo* Frank W. Fitch (pp. 65-71)
12:00	LUNCH

*Page numbers locate abstracts--with names of senior authors and co-authors.

Monday, February 12

Afternoon Session	Paul V. Harper, Jr., Chairman
1:30 P.M.	A Theoretical Description of the Performance of Scanning Systems Robert N. Beck (pp. 11-16)
	A Comparison of Radiopharmaceutical Preparations Katherine A. Lathrop (pp. 8, 9, 17, and 81)
	Selenomethionine: Theoretical and Practical Considerations Alexander Gottschalk (pp. 1-5)
	Analog Image Manipulation Donald B. Charleston (pp. 5, 16, 21-25)
3:10	INTERMISSION
3:25	Development of High Current Capabilities in the ACRH Linear Accelerator Lester S. Skaggs (pp. 26-33)
	Radiobiological and Clinical Implications of High Dose Rate Electron Beam Therapy Melvin L. Griem (pp. 36-45, 46-48)
6:00	DINNER for Visitors and Participants

Quadrangle Club
Cocktails at 6 o'c
Dinner at 7 o'c

Tuesday, February 13

Morning Session	Samuel B. Weiss, Chairman
9:00 A.M.	The Molecular Biology of Erythroid Differentiation Eugene Goldwasser (pp. 49-55)
	Structural Studies on Serum Lipoproteins Angelo Scanu (p. 94)
	Recent Progress in Normal and Abnormal Purine Metabolism Leif B. Sorensen (p. 73)
10:20	INTERMISSION
10:40	Studies on Mitochondrial Nucleic Acids Murray Rabinowitz (pp. 87-90)
	Initiation of Protein Synthesis in a Cell-Free System of Escherichia coli Tokumasa Nakamoto (p. 95)
	Effect of Bacteriophage Infection on the Sulfur-labeling of sRNA Samuel B. Weiss (p. 86)
12:00 Noon	LUNCH
1:30 P.M.	General Session
	Tour of Argonne Cancer Research Hospital, Laboratories and High Voltage Equipment

ARGONNE CANCER RESEARCH HOSPITAL

LEON O. JACOBSON	Professor of Medicine and Dean, Division of Biological Sciences, University of Chicago
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*Present address: National Institutes of Health, Bethesda, Maryland.

ABSTRACTS

This collection of abstracts includes summaries of work in progress, unpublished work, or work that has only recently appeared in the open literature. Some of the abstracts have not yet been formally presented to the AEC Washington Office of the Division of Biology and Medicine. It is therefore requested that the volume be treated as a privileged communication, not to be quoted in reference. — Margot Doyle, Editor.

NUCLEAR MEDICINE: THEORETICAL CONSIDERATIONS

NUCLEAR MEDICINE: INSTRUMENTATION

RADIATION PHYSICS AND INSTRUMENTATION

RADIOBIOLOGY

RADIATION THERAPY AND CHEMOTHERAPY

ERYTHROPOIETIN AND ERYTHROPOIESIS

METABOLISM

NEPHROLOGY

BIOCHEMISTRY

NEW PROGRAMS AT ARGONNE CANCER RESEARCH HOSPITAL

RADIOBIOLOGY

Radium-induced Malignant Tumors in Man

R. J. Hasterlik, C. E. Miller, and A. J. Finkel

The incidence of radium-induced malignant tumors and blood dyscrasias was related to current or pre-terminal radium burden measurements and to retrospective estimates of maximum burdens for a series of 293 persons, most of whom acquired radium burdens in the period 1918 to 1933, and were studied at the Argonne National Laboratory and Argonne Cancer Research Hospital. The 46 malignant diseases include 22 sarcomas, 16 neoplasms of the skull (principally mastoid and paranasal air cell carcinomas), and 8 leukemias and aplastic anemias. Retrospective estimates of maximum radium burdens were made by application of the appropriate power function for ingestion or for multiple injections.

The principal interest in the malignant tumor experience in the radium cases we have been examining lies in the implications that the data may have for radiation carcinogenesis, for oncogenic dose-response curves, and for the problem of maximum permissible levels for internally deposited bone seeking radionuclides. By relating the occurrence of a malignant tumor to an estimate of the maximum burden in each case, we have sought to avoid problems resulting from biological variability in the time of appearance of tumors and variations in body burdens that result from vagaries in the time of measurement.

The power function parameters used here in the function $R_{inj}(t)\ at^b$ are (a = 0.30 and b = -0.44) and were derived recently by an analysis of data from long term studies on 8 patients for whom suitable data are available. The lowest estimated maximum radium burden for the sarcoma cases was 6.72 μCi, and that for carcinoma of the maxilla was 1.23 μCi. The comparable value for leukemias and aplastic anemias was greater than 50 μCi. Based on the estimated maximum initial burden, these data imply at least a 12-fold margin of safety in the maximum permissible level for internally deposited radium.

(See charts on pp. 37 and 38.)

Radiobiological Experience with High Dose Rate Electrons

M. L. Griem, L. S. Skaggs, L. H. Lanzl, and F. D. Malkinson

In 1963, we reported our experience with radiation therapy using high energy electrons in a pencil beam scanning mode. This paper described the limited skin reaction observed in patient therapy with this mode of electron beam therapy. We speculated that the reason for the lack of skin reaction might be based on the possibility that the scan pattern, which was similar to that of a television raster, might resemble treatment through a grid. A second explanation of the lack of biological epidermal reaction at the surface might be postulated. A slight inhomogeneity at the surface might allow for repopulation of the basal cell layer in the skin and the partial reconstitution of the basal cells available between daily treatments. A third postulate for the lack of skin

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