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OMB CONTROL NO. 1910-1400

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U.S. DEPARTMENT OF ENERGY
UNIVERSITY RESEARCH INSTRUMENTATION PROGRAM

COVER PAGE
(THIS PAGE MUST BE THE FIRST PAGE OF THE APPLICATION)

718404

REPOSITORY Oak Ridge Operations Records Holding Area
COLLECTION DOE, 1944-84

ıme of Institution: New York University Institute of Environmental Medicine

ldress: City Tuxedo 3. State New York 4. ZIP 10987

ncipal Investigator: Fredric J. Burns

ote - The PI should preferably have an active DOE award in the designated research area)

partment: Environmental Medicine

ephone: Area Code _____ Office: 914-351-5638 Home: [redacted]

le of Application: Fluorescence Activated Cell Sorter in Radiation Carcinogenesis

a of Proposed Research (Select ONE) A *

.. Biomedical/Environmental
. Combustion/Conversion/Coal Science Chemistry
C. Energy Engineering
D. Materials/Electro-optical
E. Nuclear Physics
F. Other

earch Subcategory (See Section II of DOE/URI FY 88 Announcement) Life Science Studies

... ...al DOE Funding for Research in Selected Area (During the last two fiscal years): $ 419,022

12. Estimated Purchase Price of Equipment: $ 249,750

13. Amount Requested from DOE: $ $264,750

List all Federal agencies which are currently considering proposals from the institution involving the same or similar equipment.

Agency: none Agency Proposal Number: _____
Agency: _____ Agency Proposal Number: _____

NOTE: The institution is responsible for immediately informing the URI program manager in writing if a proposal involving similar or related equipment is submitted to a federal agency prior to the announcement of DOE's URI awards.

List any federal agency which has provided funds to the institution during the past two years for the same or similar equipment.

Agency: none Amount of Funds: _____

Please check one of the following:

☒ I authorize outside peer review of this proposal.

☐ I do not authorize outside peer review of this proposal.**

Signature of Principal Investigator: Fredric J Burns Date: 12/2/88

Name of Title of Institutional Official (President or Designee)
Ira S. Goodman, Director
Office of Grants Administration and Institutional Studies

Signature: Ira S Goodman
Date: 12/2/88

BOX No. A-51-8 2 of 3 91-57 Bldg. 2714-4
FOLDER 8902-118

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* Note - The application will be evaluated by reviewers in this field.
** Note - May prevent full consideration of this application.

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3. Summary

Title: Fluorescence-Activated Cell Sorter (FACS) in Radiation Carcinogenesis Studies

a. The proposed fluorescence activated cell sorter (FACS) permits several simultaneous measurements to be made on individual cells as they pass through a special flow chamber. Cells or chromosomes in a sample stream are delivered through a small orifice into a chamber where they are surrounded by flowing sheath fluid. The two streams then pass through a second chamber of narrowing diameter and emerge one cell at a time. A microprocessor controls the set up parameters and handles up to 7 correlated pieces of information from each individual cell. Sorting gates can be quickly established and accurate sorting is easily performed. Two and three dimensional histograms are displayed on a conventional graphics display terminal. In addition, rescaling, and statistical calculations are performed on the histograms, if desired. The proposed equipment permits the direct measurement of quantities, eg., amount of cell surface antigen, in single cells if they can bind with an appropriately labeled fluorescent marker. Numerous new markers based on recombinant DNA technology or monoclonal antibody techniques are available.

b. The Institute of Environmental Medicine is currently without a fluorescence-activated cell sorter system. One is available at the Medical Center in Manhattan but that is located 50 miles away, too far for convenient access or use. A number of research units at the Institute of Environmental Medicine will benefit from the use of a FACS system, but 8 specific projects with aggregate direct funding of almost $1

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million per year have been identified as most likely to benefit directly. The individual research projects are described in more detail in the narrative below and include energy-related life science studies, as well as, studies of basic mechanisms in carcinogenesis and toxicology, and each has graduate students working directly on the project.

c. The initial experiments to be performed on the FACS system include the following: 1. identification of chromosomes containing C-myc genetic sequences from radiation-induced cancers at different stages of development; 2. measurement of the number of different histological types of cells in the tracheal epithelium following exposure to radon and indoor pollutants; 3. identification and purification of cells in the epidermis that might be responsible for causing genetic alterations through the release of oxygenating free radicals; 4. purify aneuploid and euploid cancer cells induced by environmental carcinogens; 5. separation of precancerous cells, cancer cells based on the amount of DNA, RNA or protein as a function of the degree of progression; 6. the identification of marker keratins on cultured human fibroblasts or keratinocytes; 7. identification by sorting of cells in the tracheal epithelium exhibiting C- myc amplification following exposure to a radon surrogate and indoor pollutants; 8. to quantitate and enrich subpopulations of human skin cells in individuals exhibiting special sensitivity to the carcinogenic effects of ionizing radiation (tinea capitis patients); 9. to facilitate the transfection and cloning of specific genes such as those for specific keratins; 10. to isolate and characterize specific phenotypes of human diploid skin fibroblasts obtained from patients with multiple skin cancers.

d. The number of students graduated (90% with Ph.D.'s) within the last 5 years with speciality in life science studies was approximately 45. The number of currently enrolled graduate students is 64. The research of nearly all of these students is potentially a beneficiary of the use of the FACS system.

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U.S. DEPARTMENT OF ENERGY
UNIVERSITY RESEARCH INSTRUMENTATION PROGRAM
BUDGET PAGE

ESTIMATED COSTS

Instrumentation	Requested of DOE	Institution's Cost Sharing *(1)*	Other Federal Funds *(2)*	TOTAL
A. Purchase Price *(3)*	249,750			249,750
Maintenance *(4)*	16,450	X X X X X	X X X X X	16,450
Subtotal:	266,200			266,200
B. Other Allowable Costs				
1. Shipping/Handling	X X X X X			
2. Building/Laboratory Renovation	X X X X X	15,000		
Subtotal:		15,000		
C. TOTAL	266,200	15,000 *(5)*		281,200

NOTES:

(1) Non-Federal funds only. (However, may be provided by a third party.)

(2) Estimate funds to be obtained from other Federal agencies for purchasing the instrument, etc.

(3) Only the purchase price of the instrumentation is eligible for DOE funding through this program.

(4) See discussion of eligible maintenance costs on page 10.

(5) Only those costs specified above are eligible as cost sharing. Installation, operation, maintenance, travel and training costs, or faculty and student salaries, etc. are ineligible as cost sharing. Review discussion of eligible and ineligible costs on pages 10 and 11.

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OMB CONTROL NO. 1910-1400

DEPARTMENT OF ENERGY
UNIVERSITY RESEARCH INSTRUMENTATION PROGRAM
GRANT AND CONTRACT SUMMARY FORM

Institution Name:

Current Grant/Contract/Subcontract No. (and contractor name if subcontract)	Principal Investigator	Title	Contract Date From MO	Contract Date From YR	Contract Date To MO	Contract Date To YR	Total Award Value	$ AMT Awarded for FY Period 1986 to 1988	DOE Technical Monitor/Location
DE-FGO2 87ER60539	Dr. F.J. Burns	Oncogenic Action of Ionizing Radiation on Rat Skin	2	87	1	90	$347,467	$181,522	Dr. Benjamin Barnhart, Germantown
DE-FGO2 87ER60549	Dr. F.J. Burns	Lung Cancer Risk from Radon and Other Pollutants	3	87	2	90	525,000	237,500	Dr. Robert Thomas, Germantown
DE-FGO2 87ER60547	Dr. Naomi Harley	Radon Daughter Dosimetry in the Rat Trachoebronchial Tree	3	87	2	90	164,000	246,000	Dr. Robert Thomas, Germantown
DE-FGO2 87ER60592	Dr. Beverly Cohen	Particle Deposition as a Determinant of Radon Dose to the Respiratory Tract	3	87	2	90	150,000	225,000	Dr. Robert Thomas, Germantown

Provide information only on those research projects which are *directly related* to the selected principal research area and which were active during the period from October 1, 1986 to September 30, 1988. Do not include grants or contracts for the following: (1) workshops, (2) education/training projects or other non-research projects, (3) facilities, (4) instrumentation, (5) those projects completed before October 1, 1986.

See discussion on page 8 for additional requirements relating to subcontracts.

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RELATED FEDERAL AGENCY GRANTS AND CONTRACTS

Agency	Principal Investigator	Grant/Contract No.	Title	Grant/Contract/Dates FROM MO	FROM YR	TO MO	TO YR	Total Award Value
NCI	Dr. Seymour J. Garte	CA 43199	Oncogene Activation in Radiation Carcinogenesis	7	86	11	89	$ 230,990
NCI	Dr. Seymour J. Garte	CA 36342	Oncogene Activation in Chemical Carcinogenesis	8	84	5	92	759,619
NCI	Dr. Max Costa	CA 43070	Protein-DNA Complexes Induced by Carcinogenic Metals	1	86	4	89	251,417
NIEHS	Dr. Arthur Penn	ES 02142	Oncogene Activation in Atherosclerotic Plaques	5	79	4	90	1,037,367
NIEHS	Dr. Richard Schlesinger	ES 04242	Lung Clearance in Response to Acid Sulfate Aerosols	2	88	4	90	175,711
NIEHS	Dr. Toby Rossman	ES 03847	Effects of Carcinogens on Inserted Viral Sequences in Human Keratinocytes	12	85	6	89	1,318,293

Only provide information on research projects which are directly related to the selected principal research area.

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1988

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Of Coulter Corporation
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EPICS 753 DYE Research Cell Sorter System	Benchmark, Four Color, Multi-Parameter Sorter with 5W Argon/UV, 4W Argon/VIS and Tuneable Dye Laser, Highest Speed Sorting Electronics, Six Independent Wilkinson Type ADC's, New MDADS II™ Computer Command Console, High Resolution Graphics, Macro Generation, Unique PRISM Processor, Kinetic (Calcium) Analysis Circuitry, TouchScreen Interfacing, Highest Capacity List Mode, Digital Multiplexing for Custom Protocol Generation, InfraRed Protocol Monitor with Continuous Scanning, One Pass Gating with Multiple Bit Map Regions and Live Time Display, 50meg Hard Drive, Graphics Printer, IBM and DEC Compatibility	$249,750.

EPICS 753 DYE Research Cell Sorter System Options	AUTO-CLONE® Single Cell Deposition System with Printer	$9,000.
	MicroSample Delivery System	$17,500.
	Removable Hard Disk	$2,000.
	Biohazard Containment System	$1,500.
	Confocal Lens Assembly	$750.
	Five Year Warranty	$82,250.

EPICS 753 DYE Off System IBM Software and Computer Options	IBM Compatible EASY 2™ Multi-Applications Software	$9,850.
	IBM Compatible GateWay MultiColor List Mode Analysis Software With RAINBOW	$7,500.
	EASY 2 Color/Color Work Station with Intel 386 Processor, 40meg Hard Drive, Mouse, Removable 10meg Hard Drive	$10,980.
EPICS 753 DYE Off System DEC Software and Computer Options	MicroVAX™ II File Server with 71meg Hard Drive, 95meg Streaming Tape, VT330 Graphics Terminal, 5 Serial Ports, MicroVMS™ License and Documentation	$28,290.
	MicroVAX II File Server with 71meg Hard Drive, 159meg Hard Drive, 95meg Streaming Tape, VT330 Graphics Terminal, 5 Serial Ports, MicroVMS License and Documentation	$36,580.
	DECnet™ with Full Function License, VMS Service for MS-DOS™ License PCSA Client Software for IBM® PC, DEQNA Ethernet Controller, Thin Wire Adapter, and Documentation	$11,960.
	EPINET/DECNET Software for Communication and Conversion of Files to Flow Cytometry Standard	$6,200.
	Note: MicroVAX II Configurations Require GateWay or Easy 2 Software and an IBM Compatible Computer for Distributed Processing Operation	

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Epics Reagents and Controls	Immuno-Sure Scatter and Fluorescence Biological Control Pack	$250.
	Immuno-Brite Linearity Calibrator Kit	$450.
	Immuno-Check Alignment Fluorospheres	$180.
	DNA-Check Alignment Fluorospheres	$250.
	IsoFlow™ Sheath Fluid (10L)	$12.50
	COULTER CLENZ™ Fluidics Detergent (10L)	$49.95
Training	Eight day training course for two operators at the Coulter Education Center in Miami Lakes, Florida is included. Airfare is the buyer's responsibility.	
Installation	Installation by an Epics Field Service Engineer is included.	
Terms	Net 30 days. Freight is F.O.B. Hialeah, Florida, prepaid to destination and added to your invoice.	
Warranty	Epics products are warranted against defects in materials and workmanship for a period of one year from shipment. Lasers are warranted by Coherent for one year Coherent for one year or 2000 hours.	

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Artfully advancing the science of flow cytometry

6. Narrative

The Institute of Environmental Medicine, in its 41st year, is a department of the New York University School of Medicine and Post- Graduate Medical School. The parent institution is located in Manhattan, New York City, but the Department of Environmental Medicine is split (about 1/3 : 2/3) between New York City and Sterling Forest, New York, a research park approximately 50 miles northwest of New York City.

The principal missions of the Institute are to conduct research into the biological mechanisms of environmental health hazards and to train graduate and medical students for careers in research, teaching and other professional service. The Institute's research and teaching programs are carried out by a full-time faculty of 50, a supporting staff of 85 and approximately 70 graduate students and post-doctoral fellows.

The DOE-sponsored research projects for which the FACS system is being requested have as their main objectives: 1. elucidation of the dose- response relationships for carcinogenesis associated with exposure to environmental agents, especially ionizing radiation, and 2. evaluation of the cancer risk associated with the inhalation of radon and other indoor pollutants.

Other federally sponsored research projects that will use the FACS system include studies of environmental carcinogenesis and transformation by chemicals, the mechanism of environmental atherosclerosis as a benign proliferative disease, the toxicity of metal compounds, and the pathogenesis of respiratory toxins. Throughout its existence

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researchers at the Institute of Environmental Medicine have contributed significantly to an understanding of underlying biological mechanisms in the above areas.

The DOE-sponsored research that would directly utilize the requested FACS system is under the direction of Professor Fredric J. Burns. These studies have helped to elucidate the role of repair processes in whole animal cancer induction and have established the importance of radiation quality, specifically the linear energy transfer (LET), in cancer induction (1,2). As an outgrowth of the experimental studies, a simple model based on 2 DNA alterations and radiation track structure was developed. The model turned out to be surprisingly useful for describing a variety of experimental findings related to the effects of dose, dose rate, LET and the temporal pattern of exposure (3,4). The practical purpose of these studies is to find a plausible strategy for extrapolating human risk estimates to low doses and dose rates.

From our own and numerous other studies, it is reasonably clear that carcinogenesis is a complex, multistage progression involving perhaps as many as 6 genetic alterations any one of which might expand by clonal growth into a precancerous lesion (2). We are interested in what specific genetic alterations might be occurring and especially whether direct action of the radiation on the DNA might be involved in producing these alterations. As an approach to this problem, we sought to identify genetic alterations in the cancer themselves (5,6). A group of 12 rat skin tumors was examined for activation of the ras and c-myc oncogenes. DNA extracted from the cancer cells was transfected into NIH/3T3 cells by calcium phosphate coprecipitation. Positive

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transfections were obtained from 3 poorly differentiated clear cell carcinomas, a sebaceous carcinoma, a squamous carcinoma and a sarcoma. Southern blot analysis of DNA from primary and secondary transfectants, as well as from nude mouse tumors arising after injection of transfected cells revealed the presence of rat derived restriction fragments homologous to the K-ras oncogene. Southern hybridization of the original radiation induced cancer DNAs to a third exon human c-myc probe revealed gene amplification and restriction fragment polymorphisms in 10 of the 12 cancers after digestion with the restriction enzymes, Bam HI, Eco RI, or Hind III. Hybridization of the tumor DNAs to v-abl, c-myb, K-ras, or the first and second exons of N-myc showed no differences in band intensity or number. We are currently examining tumor progression in relation to myc and K-ras activation.

A second DOE-sponsored project under the direction of Dr. Burns is investigating the cancer risk associated with the inhalation of radon. Direct measurement of DNA strand breaks in the respiratory epithelium is being made following exposure to a radon surrogate (Polonium 210) in combination with inhalation of the respiratory irritants, nitrous oxide and cigarette smoke. DNA strand breaks are measured by extracting the DNA and eluting it on polycarbonate filters. At the same time the cancer incidence for the same exposure pattern is being established in separate groups of animals.

The following is a list of the research projects at the Institute of Environmental Medicine that have been selected as most likely to benefit from the use of the requested FACS system. The overall objectives, titles, sponsors and principal investigators are also listed.

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These investigators are participating in the present proposal as co-investigators. The first 2 projects are the DOE-sponsored studies outlined above.

1. Title: The oncogenic action of ionizing radiation.

   Objective: To achieve a better understanding of the mechanism of radiation carcinogenesis by studying quantitative relationships between cancer incidence and radiation dose, dose rate, linear energy transfer, etc.. The information gained is relevant to developing extrapolation strategies for low dose risk assessment.

   Sponsor: Department of Energy

   Investigator: Dr. Fredric J. Burns

2. Title: Lung cancer risk from radon and other pollutants.

   Objective: To determine the importance of other indoor air pollutants on the DNA damage and cancer incidence associated with exposure to radon. Considerable epidemiologic evidence exists relating lung cancer risk in uranium miners to the inhalation of radon. Since the type and concentration of ambient pollutants in a uranium mine are different from those found in the home, this project will help to determine if the uranium miner risk data are relevant to exposure in the home environment.

   Sponsor: Department of Energy

   Investigator: Dr. Fredric J. Burns

3. Title: Oncogene Activation in Radiation Carcinogenesis.

   Objective: To identify the critical genetic events in the radiation- induced progression from a normal cell to a cancer cell.

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These studies are focussing on the activation of myc and K-ras oncogenes. Initial results indicate that amplification of c-myc is a critical event in radiation carcinogenesis.

Sponsor: National Cancer Institute

Investigator: Dr. Seymour Garte.

4. Title: Oncogene Activation in Chemical Carcinogenesis.

Objective: To determine whether the pattern of oncogene activation is carcinogen-specific for mouse skin and the rat nasal cavity. The carcinogens under study are a series of specially selected, direct- acting alkylating agents.

Sponsor: National Cancer Institute and the National Institute of Environmental Health Sciences.

Investigator: Dr. Seymour Garte

5. Title: The effect of Nickel and Other Metal Ions on Specific DNA-Protein Interactions. Objectives: Nickel compounds produce anomalous alterations in heterochromatic regions of the chromosomes. The goal of this project is to obtain a better understanding of the effect of nickel and other metal ions on specific regions of the mammalian chromosome. These results may help to explain the cytotoxicity and carcinogenicity of metal ions, such as, nickel.

Sponsor: National Cancer Institute and National Institute of Environmental Health Science

Investigator: Dr. Max Costa.

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6. Title: Oncogene Activation in Atherosclerotic Plaques.

   Objective: To identify the factors responsible for, and mechanisms involved in, the proliferation of smooth muscle cells, which is critical to the development of arteriosclerotic plaques in vivo.

   Sponsor: National Institute of Environmental Health Sciences.

   Investigator: Dr. Arthur Penn.

7. Title: The effect of irritants on pulmonary defenses.

   Objective: To understand the role of lung clearance dysfunction in the pathogenesis of chronic respiratory disease.

   Sponsor: National Institute of Environmental Health Sciences

   Investigator: Dr. Richard Schlesinger.

8. Title: The effects of carcinogens on inserted viral sequences in DNA of mammalian cells.

   Objective: To test the hypothesis that the capacity of a cell to amplify SV40 sequences in response to carcinogens depends on the site of integration.

   Sponsor: National Institute of Environmental Health Science

   Investigator: Dr. Toby Rossman.

Description of Initial Planned Experiments

There are, of course, numerous experiments that will be done with this instrument once it becomes available. The following is a short description of the 8 experiments that would have our highest priority as examples of the type of work we expect to perform. The first 3 experiments are described in moderate detail.

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Experiment #1.

Title: The identification of chromosomes containing C-myc genetic sequences from radiation induced tumors at different stages of tumor development.

Objective: To isolate chromosomes from the cancers and to determine the location of c-myc sequences by flow cell sorting.

Rationale: We already have evidence that c-myc sequences are amplified in 10 of 12 radiation-induced cancers so far studied. What is unclear is how the radiation may be involved in producing the amplification. It is possible that amplification of c-myc and possibly other sequences is a late event associated with tumor progression and is not the result of direct action by the radiation. By sorting the chromosomes and utilizing a c-myc probe we hope to establish where the amplified sequences are located in different cancers and in different developmental stages of the same cancer.

Methods of Procedure: Cancers will be induced by ionizing radiation in rat skin. As the cancers develop biopsy samples will be taken from the cancerous tissue. The cells will be separated and chromosome preparations will be passed through the FACS after labeling with a fluoresceinated c-myc probe. The sorted chromosomes will be identified by Giemsa staining after collection on microscope slides. The cancers (and cells lines derived from the cancers) will be disaggregated by gentle trypsinization and chromosomes will be harvested following treatment with a stathmokinetic compound (vinblastine) and hypotonic conditions. After sorting up to 5 million chromosomes by use of the FACS system, the DNA will be extracted, digested with EcoRI, size fractionated by electrophoresis, and transferred to nitrocellulose (7,8). Hybridization with

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gene probes for several oncogenes with known chromosome locations, such as, c-mos and c-raf-1 will be performed as a means of determining whether there have been internal rearrangements or translocations within the c-myc containing chromosomes (9,10,11). In this way we will be able to establish the chromosomal location of the c-myc gene in the radiation induced cancers. We will be able to establish whether the gene has been translocated or relocated in association with the observed amplification and whether the alteration is consistent in all tumors.

Expected Results: We expect that the c-myc gene will be translocated and rearranged as a result of the DNA breakage associated with radiation damage. We also expect that as the tumor cells progress, additional rearangements and translocations and amplifications will occur. Early or small cancers should show fewer changes than later cancers. There may also be a dependence on the histological type of cancer, squamous carcinoma in comparison to sarcoma, for example.

Experiment #2

Title: Sorting of tracheal epithelial cells following exposure to radon

Objective: To establish the relative proportion of keratinocytes, inflammatory cells, and other cells in the tracheal epithelium.

Rationale: When respiratory epithelium is exposed to carcinogens, dramatic changes in the cell populations occur. The normal secretory cells begin proliferating within hours of the exposure; inflammatory cells infiltrate within days and eventually keratinization occurs through squamous metaplasia. These population changes lead up to cancer and can be followed quantitatively through the use of the FACS system and probes for specific cell types.

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Methods of procedure: Virtually all nucleated epidermal cells express beta 2- microglobulin which is associated with HLA-A, but not other cells of the skin. Monoclonal antibodies specific for this antigen can be used to identify keratinizing epidermal cells and basal cells (12,13). Similar probes for the mucous secreting cells are available. These probes are conjugated with different types of fluorescent dyes so that simultaneous analysis and sorting can be performed with the FACS system. The FACS will be used to enrich or deplete cell suspensions of antigenically distinct subpopulations and to quantitate the numbers of cells in such identifiable subpopulations.

Expected results: Initially we expect to see an increase in the number of basal cells as a result of the initial proliferative reaction. Later we expect the number of inflammatory cells to increase followed by an increase in the number of keratinizing cells. Each of these changes may depend on the dose of the radiation and on the dose of irritants, such as nitrous oxide or cigarette smoke, which will be applied as respiratory irritants.

Experiment #3:

Title: The identification and purification of cells in the epidermis that might be responsible for causing genetic alterations through the release of oxygenating free radicals.

Objective: to sort irradiated skin cells based on the potential for release of oxygenating free radicals.

Rationale: We have preliminary data indicating that irradiation of deeper layer of skin causes DNA strand breaks in the nearby, but unirradiated, epidermis. Our hypothesis to explain these results is that the

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breaks are caused by the release of oxygenating free radicals in the deeper skin tissue that migrate to the surface and damage the DNA of the surface cells. The FACS system is essential for testing this hypothesis. As a preliminary to the performance of this experiment, we will develop fluorescent probes capable of identifying cells capable of releasing oxygenating free radicals.

Methods of procedure: Rat skin will be irradiated with electrons to a depth that will stimulate the release of the hypothesized oxygenating free radical that breaks the DNA in the epidermis. By gentle trypsinization the epidermal cells can be separated from the underlying dermis and then sorted on the FACS using probes specific for different cell types (14,15).

Expected results: We expect the cells capable of releasing oxygenating free radicals to occur initially in the deeper dermis and to be the same as the inflammatory leukocytes that are commonly seen following irradiation. As time goes on these cells may disappear or they may migrate to more superficial locations. They may also increase in number by increased infiltration or by proliferation. The FACS system will permit us to determine the proportion of cells in the G-2 phase of the cell cycle which should indicate the number of cells in or about to enter mitosis.

Examples of other initial experiments to be performed with this equipment are listed below:

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4. purification of aneuploid and euploid cancer cells induced by environmental carcinogens,

5. separation of precancerous cells, cancer cells based on the amount of DNA, RNA or protein as a function of the degree of progression,

6. the identification of marker keratins on cultured human fibroblasts or keratinocytes,

7. identification by sorting the cells in the tracheal epithelium exhibiting C- myc amplification following exposure to a radon surrogate and indoor pollutants,

8. to quantitate and enrich subpopullations of human skin cells in individuals exhibiting special sensitivity to the carcinogenic effects of ionizing radiation (tinea capitis patients),

9. to facilitate the transfection and cloning of specific genes such as those for specific keratins,

10. to isolate and characterize specific phenotypes of human diploid skin fibroblasts obtained from patients with multiple skin cancers,

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1. Burns, F.J. and Albert, R.E. Radiation carcinogenesis in rat and mouse skin. In: Radiation Carcinogenesis, edited by A.C. Upton, R.E. Albert, F.J. Burns, and R. Shore, Elsevier, New York, NY, 1986, pp. 199-214.

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4. Sargent, E.V. and Burns, F.J. Repair of radiation-induced DNA damage in rat epidermis as a function of age. Radiat. Res. 102:176-181, 1985.

5. Garte, S.J., Sawey, M.J. and Burns, F.J. Oncogenes activated in radiation-induced rat skin tumors. In: Radiation Carcinogenesis and DNA Alterations, edited by F.J. Burns, A.C. Upton, and G. Silini, Plenum Publishing Corp., New York, NY, 1986, pp. 389-397.

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11. Fukushige, S., Murotsu, T. and Matsubara, K. Chromosomal assignment of human genes for gastrin, thyrotropin (TSH)-beta subunit and C-erbB-2 by chromosome sorting combined with velocity sedimentation and Southern hybridization. Biochem. Biophys. Res. Commun. 134:477-483, 1986.

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13. Look, A.T., Peiper, S.C., Douglass, E.C., Trent, J.M. and Sherr, C.J. Amplification of genes encoding human myeloid membrane antigens after A-mediated gene transfer. Blood 67:637-645, 1986.

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14. Morhenn, V.B., Benike, C.J., Charron, D.J., Cox, A., Mahrle, G., Wood, G.S. and Engleman, E.G. Use of the fluorescence-activated cell sorter to quantitate and enrich for subpopulations of human skin cells. J. Invest. Dermatol. 79:277-282, 1982.

15. Bordin, S., Page, R.C. and Narayanan, A.S. Heterogeneity of normal human diploid fibroblasts: isolation and characterization of one phenotype. Science 223:171-173, 1984.

b. Qualifications of the Faculty.

The faculty involved in this proposal have extensive experience in the following areas: whole animal carcinogenesis, DNA damage and repair, mammalian cell mutagenesis, cytotoxicity of metals, transformation, transfection, microscopy of normal and cancerous tissue, autoradiography, oncogene activation, cell and tissue culture, as well as other areas of cell and molecular biology. All have published extensively on the results of their studies (see section 8).

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7. Estimated Cost and Budget

Budget Justification: The model of FACS requested is the Epics 750 manufactured by Coulter Corporation. Coulter recommends this model for multiuser applications as it has the greatest degree of flexibility for different types of uses, eg. dual laser uses, and at the same time is the easiest to operate. The instrument design is such that Coulter does not believe a full-time dedicated technician is necessary. The instrument can be operated by several trained technicians representing different research projects with one having oversight responsibility. Time allotments for use of the instrument would be determined by a committee of all investigators or their representatives with Dr. Burns serving as chair of the committee. This committee would also allocate maintainance and repair costs to the various projects in proportion to time allotments. All investigators and students at the Institute of Environmental Medicine would be eligible to use the instrument, and the FACS committee would endeavor to assign allotment priorities in a way that would assure access to as many investigators as possible.

Budget for 5 years

	year 1	year 2	year 3	year 4	year 5
Purchase	$249,750	-	-	-	-
Maintenance (1)	16,450	16,450	16,450	16,450	16,450
		-	-	-	-
Renovations (2)	15,000	-	-	-	-

(1) Maintenance costs are not being requested and are to be considered as institutional cost sharing. These costs will be distributed to users as described above.

(2) Installation/Renovation - Room 232 will house the FACS. This laboratory will need certain alterations to accomodate the unit, including plumbing, benchwork, and carpentry estimated by NYU Plant and Maintenance to be approximately $15,000.

1127750

PRINCIPAL INVESTIGATOR/PROGRAM DIRECTOR: _____

BIOGRAPHICAL SKETCH

Give the following information for the key personnel and consultants listed on page 2. Begin with the Principal Investigator/Program Director. Photocopy this page for each person.

NAME	POSITION TITLE	BIRTHDATE (Mo., Day, Yr.)
Fredric J. Burns	Professor	[redacted]

EDUCATION (Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.)

INSTITUTION AND LOCATION	DEGREE	YEAR CONFERRED	FIELD OF STUDY
[redacted]	[redacted]	[redacted]	[redacted]

RESEARCH AND PROFESSIONAL EXPERIENCE: Concluding with present position, list, in chronological order, previous employment, experience, and honors. Include present membership on any Federal Government public advisory committee. List, in chronological order, the titles and complete references to all publications during the past three years and to representative earlier publications pertinent to this application. DO NOT EXCEED TWO PAGES.

Experience

1961 - 1967 Assistant Research Scientist, New York University Medical Center

1967 - 1969 Postdoctoral Fellow, Institute of Cancer Research

1969 - 1975 Assistant Professor, Department of Environmental Medicine, New York University Medical Center

1975 - 1978 Associate Professor, Department of Environmental Medicine, New York University Medical Center

1978 - Present Professor, Department of Environmental Medicine, New York University Medical Center

Representative Publications

Burns, F.J., R.E. Albert and B. Altshuler. Cancer progression in mouse skin. In: Mechanisms of Tumor Promotion, Vol. II (T.J. Slaga, Ed.) CRC Press, 1984, pp. 17-40.

Housey, G.M., P. Kirschmeier, S.J. Garte, F. Burns, W. Troll and I.B. Weinstein. Expression of long terminal report (ltr) sequences in carcinogen-induced murine skin carcinomas. Biochem. Biophys. Res. Comm. 127: 391-398 (1985).

Sargent, E.V. and F.J. Burns. Repair of radiation-induced DNA damage in rat epidermis as a function of age. Radiat. Res. 102: 176-181 (1985).

Burns, F.J. and R.E. Albert. Radiation carcinogenesis in rat and mouse skin. In: Radiation Carcinogenesis (A.C. Upton, R.E. Albert, F. Burns and R. Shore, Eds.) Elsevier, New York, 1985, pp. 199-215.

Burns, F.J. and R.E. Albert. The dose-response for radiation-induced cancer in rat skin. In: Radiation Carcinogenesis and DNA Alterations (F.J. Burns, A.C. Upton, G. Silini, Eds.) Plenum Press, NY, 1986, pp. 51-70.

Garte, S.J., M.J. Sawey and F.J. Burns. Oncogenes activated in radiation-induced rat skin tumors. In: Radiation Carcinogenesis and DNA Alterations (F.J. Burns, A.C. Upton and G. Silini, Eds.) Plenum Inc., New York, 1986, pp. 389-397.

Sawey, M.J., A.T. Hood, F.J. Burns and S.J. Garte. Activation of C-myc and C-K-ras oncogenes in primary rat tumors induced by ionizing radiation. Mol. and Cell. Biol. 7: 932-935 (1987).

BIOGRAPHICAL SKETCH

Give the following information for the key personnel and consultants listed on page 2. Begin with the Principal Investigator/Program Director. Photocopy this page for each person.

NAME	POSITION TITLE	BIRTHDATE (Mo., Day, Yr.)
Seymour J. Garte	Associate Professor	[redacted]

EDUCATION (Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.)

INSTITUTION AND LOCATION	DEGREE	YEAR CONFERRED	FIELD OF STUDY
[redacted]	[redacted]	[redacted]	[redacted]

RESEARCH AND PROFESSIONAL EXPERIENCE: Concluding with present position, list, in chronological order, previous employment, experience, and honors. Include present membership on any Federal Government public advisory committee. List, in chronological order, the titles and complete references to all publications during the past three years and to representative earlier publications pertinent to this application. DO NOT EXCEED TWO PAGES.

EXPERIENCE:

1970 - 1975	Lecturer, Department of Chemistry, City College of New York
1975 - 1976	Postdoctoral Fellow, Department of Environmental Medicine New York University Medical Center
1976 - 1979	Associate Research Scientist, Department of Environmental Medicine New York University Medical Center
1979 - 1987	Assistant Professor, Department of Environmental Medicine, New York University Medical Center
1987 - Present	Associate Professor, Department of Environmental Medicine New York University Medical Center
Present	Program leader for Research in Carcinogenesis for the Environmental Health Sciences Center, Institute of Environmental Medicine.
	Director, Laboratory of Molecular Oncology.

Representative Publications:

Sawey, M.J., Hood, A.T., Burns, F.J., and Garte, S.J. Activation of ras and myc oncogenes in radiation induced rat skin tumors. Mol. Cell Biol., 7:932-935, 1987.

Garte, S.J. Phorbol ester effects on adrenergic hormone signal transduction in normal and H-ras transformed cells. New York Acad. Sci., 494:111-113, 1987.

Hood, A.T., Currie, D.C., and Garte, S.J. Establishment of a rat nasal epithelial tumor cell line. In Vitro, 23:274-278, 1987.

Garte, S.J., Currie, D.C. and Troll, W. Protease inhibitors inhibit transformation of NIH3T3 cells by transfection with the H-ras oncogene. Cancer Res., 47:3159-3162, 1987.

Garte, S.J. Activation of multiple oncogene pathways: a model for experimental carcinogenesis. J. Theor. Biol., 129:177-188, 1987.

Hochwalt, A.E., Solomon, J.J., and Garte, S.J. Mechanism of H-ras oncogene activation in mouse squamous carcinoma induced by an alkylating agent. Cancer Res., 48: 556-558, 1988.

Garte, S.J., Sawey, M.M., Burns, F.J., Felber, M., and Ashkenazi-Kimmel, T. Multiple oncogene activation in a radiation carcinogenesis model. In: Anticarcinogenesis and Radiation Protection., (P. Cerutti, F. Nygaard, and M. Simic, eds.), in press.

Hochwalt, A.E., Wirgin, I., Felber, M., Currie, D., and Garte, S.J. Detection of novel non-ras oncogenes in rat nasal squamous cell carcinomas. Molec. Carcinogenesis, in press.

Garte, S.J. and Hochwalt, A.E. Oncogene activation in experimental carcinogenesis: the roles of carcinogen and tissue specificity. Environ. Health Perspect., in press.

BIOGRAPHICAL SKETCH

Give the following information for the key personnel and consultants listed on page 2. Begin with the Principal Investigator/Program Director. Photocopy this page for each person.

NAME	POSITION TITLE	BIRTHDATE (Mo., Day, Yr.)
Max Costa, Ph.D.	Professor	[redacted]

EDUCATION (Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.)

INSTITUTION AND LOCATION	DEGREE	YEAR CONFERRED	FIELD OF STUDY
[redacted]	[redacted]	[redacted]	[redacted]

RESEARCH AND PROFESSIONAL EXPERIENCE: Concluding with present position, list, in chronological order, previous employment, experienc and honors. Include present membership on any Federal Government public advisory committee. List, in chronological order, the titles and cor plete references to all publications during the past three years and to representative earlier publications pertinent to this application. DO NC EXCEED TWO PAGES.

1970-1974 Research Assistant, NIH (NCI and NIMH), Bethesda, MD

1974-1976 Graduate Research Assistant, Department of Pharmacology, University of Arizona Medical School, Tucson, AZ

1976-1977 Postdoctoral Fellow, University of Arizona Medical School, Tucson, AZ

1977-1979 Assistant Professor, Department of Laboratory Medicine, University of Connecticut School of Medicine, Farmington, CT

1979-1980 Assistant Professor, Department of Pharmacology and Toxicology, College of Medicine, Texas A & M University, College Station, TX

1980-1985 Assistant Professor (1980); Associate Professor (1981-85); Department of Pharmacology, University of Texas Medical School, Houston, TX

1985-1986 Professor, Department of Pharmacology, University of Texas Medical School, Houston, TX

1986-present Professor of Environmental Medicine and Pharmacology, Institute of Environmental Medicine, New York University Medical Center, New York, NY

Selected Publications

Sen, P. and Costa, M. (1986). Incidence and localization of sister chromatid exchanges induced by nickel and chromium compounds. Carcinogenesis 7(9): 1527-1533.

Conway, K., Wang, X.-W., Xu, L.-S. and Costa, M. (1987). Effect of magnesium on nickel-induced genotoxicity and cell transformation. Carcinogenesis 8(8): 1115-1121.

Sugiyama M., Costa, M., Nakagawa, T., Hidaka, T. and Ogura. R. (1988). Stimulation of polyadenosine diphosphoribose synthesis by DNA lesions induced by sodium chromate in Chinese hamster V-79 cells. Cancer Res. 48: 1100-1104.

Wang, X.-W., Imbra, R. J. and Costa, M. (in press, 1988). Characterization of mouse cell lines resistant to nickel(II) ions. Cancer Res.

Miller, C. A. III and Costa, M. (in press, 1988). Characterization of DNA-protein complexes induced in intact cells by the carcinogen chromate. Molecular Carcinogenesis.

BIOGRAPHICAL SKETCH

Give the following information for key professional personnel listed on page 2, beginning with the Principal Investigator/Program Director. Photocopy this page for each person.

NAME	TITLE	BIRTHDATE (Mo., Day, Yr.)
Arthur L. Penn	Research Professor	[redacted]

EDUCATION (Begin with baccalaureate or other initial professional education and include postdoctoral training)

INSTITUTION AND LOCATION	DEGREE (circle highest degree)	YEAR CONFERRED	FIELD OF STUDY
[redacted]	[redacted]	[redacted]	[redacted]

RESEARCH AND/OR PROFESSIONAL EXPERIENCE: Concluding with present position, list in chronological order previous employment, experience, and honors. Include present membership on any Federal Government Public Advisory Committee. List, in chronological order, the titles and complete references to all publications during the past three years and to representative earlier publications pertinent to this application. **DO NOT EXCEED TWO PAGES.**

EXPERIENCE

1965: Half-time Lecturer (Biology), Queens College, Queens, NY

1965 - 1966: Research Assistant, Hunter College, New York, NY

1965 - 1968: Half-time Lecturer (Biology), Hunter College, New York, NY

1973 - 1975: Biologist (and Graduate Student), Biomedical Sciences Division, Lawrence Livermore Laboratory, University of California, Livermore, CA

1976 - 1977: Molecular Biologist, Biomedical Sciences Division, Lawrence Livermore Laboratory, University of California, Livermore, CA

1977 - 1982: Assistant Professor, Department of Environmental Medicine, New York University Medical Center, New York, NY

1982 - 1985: Associate Professor, Department of Environmental Medicine, New York University Medical Center, New York, NY

1985-Present: Research Professor, Department of Environmental Medicine, New York University Medical Center, New York, NY

PUBLICATIONS

Liburdy, R. and Penn, A. Microwave bioeffects in the erythrocyte are temperature and pO_2 dependent. Bioelectromagnetics, 5:283-291, 1984.

Penn, A. and Nesta, D. Enhanced expression of a high molecular weight protein in arteriosclerotic plaques. Atherosclerosis, 53:31-36, 1984.

Liburdy, R. and Penn, A. Microwave effects on membrane transport occur at the phase transition temperature. Annals NY Acad. Sci., 435:432-435, 1984.

Edinger, F. and Penn, A. Tumor promoter-stimulated protein phosphorylation in mouse epidermis is inhibited by bromophenacyl bromide. J. Invest. Derm., 84:413-416, 1985.

Yager, J., Zurlo, J., and Penn, A. Enhanced reactivation of UV irradiated Herpes virus caused by heat shock and UV irradiation of Vero cells: lack of role of heat shock proteins. Mutation Res., 146:121-128, 1985.

Penn, A., Garte, S.G., Warren, L., Nesta, D., and Mindich, B. Transforming gene in human atherosclerotic plaque DNA. Proc. Natl. Acad. Sci., USA, 83:7951-7955, 1986.

Penn, A., Garte, S., and Warren, L. Transforming sequences associated with atherosclerotic plaque DNA. IN: Cardiovascular Disease, 1986, Plenum Press, NY, in press.

BIOGRAPHICAL SKETCH

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NAME	POSITION TITLE	BIRTHDATE (Mo., Day, Yr.)
Richard B. Schlesinger	Professor	[redacted]

EDUCATION (Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.)

INSTITUTION AND LOCATION	DEGREE	YEAR CONFERRED	FIELD OF STUDY
[redacted]	[redacted]	[redacted]	[redacted]

RESEARCH AND PROFESSIONAL EXPERIENCE: Concluding with present position, list, in chronological order, previous employment, experience, and honors. Include present membership on any Federal Government public advisory committee. List, in chronological order, the titles and complete references to all publications during the past three years and to representative earlier publications pertinent to this application. DO NOT EXCEED TWO PAGES.

1968-1969....Research Asst., Environmental Science Section, Food and Drug Research Labs., Maspeth, NY.

1969-1971....Research Asst., Institute of Environmental Medicine, NYU Medical Center, NY, NY.

1971-1975....Asst. Research Scientist, Institute of Environmental Medicine, NYU Medical Center, NY, NY.

1975-1978....Associate Research Scientist, Institute of Environmental Medicine, NYU Medical Center, NY, NY.

1978-1982....Asst. Professor, Institute of Environmental Medicine, NYU Medical Center, NY, NY.

1982-1985....Associate Professor, Institute of Environmental Medicine, NYU Medical Center, NY, NY.

1986-pres....Director, Laboratory of Pulmonary Biology and Toxicology, Institute of Environmental Medicine, NYU Medical Center, NY, NY.

1987-pres....Professor, Institute of Environmental Medicine, NYU Medical Center, NY, NY.

Selected Publications

Schlesinger, R.B. Intermittent inhalation of nitrogen dioxide: Effects on rabbit alveolar macrophages. J. Toxicol. Environ. Health 21: 127-134 (1987).

Schlesinger, R.B. and K.E. Driscoll. Mucociliary clearance from the lungs of rabbits following single and intermittent exposures to ozone. J. Toxicol. Environ. Health 20: 125-134 (1987).

Schlesinger, R.B. Functional assessment of rabbit alveolar macrophages following intermittent inhalation exposures to sulfuric acid mist. Fund. Appl. Toxicol. 8: 328-334 (1987).

Schlesinger, R.B. Effects of intermittent inhalation exposures to mixed atmospheres of NO_2 and H_2SO_4 on rabbit alveolar macrophages. J. Toxicol. Environ. Health 22: 301-312 (1987).

Driscoll, K.E. and R.B. Schlesinger. Alveolar macrophage-stimulated neutrophil and monocyte migration: Effects of in vitro ozone exposure. Toxicol. Appl. Pharmacol. 93: 312-318 (1988).

Driscoll, K.E., G.D. Leikauf and R.B. Schlesinger. The effects of in vitro and in vivo ozone exposure on eicosanoid production by rabbit alveolar macrophages. Inhalation Toxicology 1: 109-122 (1988).

Gearhart, J.M. and Schlesinger, R.B. Response of the tracheobronchial mucociliary clearance system to repeated irritant exposure: Effect of sulfuric acid mist on structure and function. Exp. Lung Res. (In press).

PRINCIPAL INVESTIGATOR/PROGRAM DIRECTOR

BIOGRAPHICAL SKETCH

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NAME	POSITION TITLE	BIRTHDATE (Mo., Day, Yr.)
Toby G. Rossman	Professor	[redacted]

EDUCATION: Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.

INSTITUTION AND LOCATION	DEGREE	YEAR CONFERRED	FIELD OF STUDY
[redacted]			

RESEARCH AND PROFESSIONAL EXPERIENCE: Concluding with present position, list, in chronological order, previous employment, awards and honors. Include present membership on any Federal Government public advisory committee. List, in chronological order, the titles and complete references to all publications during the past three years and to representative earlier publications pertinent to this application. DO NOT EXCEED TWO PAGES.

EMPLOYMENT

1971-1973	Associate Research Scientist, Environmental Medicine, New York University Medical Center.
1974-1978	Assistant Professor, Environmental Medicine, NYU Med. Ctr.
1978-1985	Associate Professor, Environmental Medicine, NYU Med. Ctr.
1985-Present	Professor, Environmental Medicine, NYU Med. Ctr.

SELECTED PUBLICATIONS

Rossman, T.G., Molina, M. and Klein, C.B. Comutagens in E. coli and Chinese hamster cells with special attention to arsenite. In: Genetic Toxicology of Environmental Chemicals. C. Ramel (Ed.), Alan R. Liss, Inc., New York (1986) pp. 403-408.

Rossman, T.G. and Molina, M. The genetic toxicology of metal compounds: II. Enhancement of ultraviolet-induced mutagenesis in E. coli WP2. Environ. Mut., 8:263-271, 1986.

Rossman, T.G., Naslung, M. and Klein, C. Ascorbate enhances UV-mutagenesis in E. coli but inhibits it in Chinese hamster cells. Carcinogenesis 7:727-732, 1986.

Rossman, T.G., Zelikoff, J.T., Agarwal, S. and Kneip, T.J. Genetic toxicology of metal compounds: An examination of appropriate cellular models. Toxicol. Environ. Chem. 14: 251-263, 1987.

Shirname-More, L., Rossman, T.G., Troll, W., Teebor, G.W. and Frenkel, K. Genetic effects of 5-hydroxymethyl-2'-deoxyuridine, a product of ionizing radiation. Mutat. Res. 178:177-186, 1987.

Rossman, T.G. and Rubin, L. Identification of mammalian cell clones containing amplified, transfected or expressed sequences. Somatic Cell Mol. Genet. (In press).

Rossman, T.G. and Klein, C.B. From DNA damage to mutation in mammalian cells. Environ. Mol. Mutagen. 11:119-133 (1988).

Rossman, T.G., Rubin, L.M. and Li, J.-H. Probing mammalian clones: A new method with application for mutagenesis research. In:Banbury Report 28 on Mammalian Cell Mutagenesis. M. Moore, D. DeMarini, F. deSerres, K. Tindall (Eds.) Cold Spring Harbor Laboratory, pp. 301-304, 1987.

Steinberg, M.L., Rossman, T. and Morris, A. MNNG-induced DNA rearrangements of SV40 infected human keratinocytes. Cancer Research (In revision).

OMB CONTROL NO. 1910-0400

U.S. DEPARTMENT OF ENERGY

ASSURANCE OF COMPLIANCE

Nondiscrimination in Federally Assisted Programs

(Hereinafter called the "Applicant")

(Name of Applicant)

HEREBY AGREES to comply with Title VI of the Civil Rights Act of 1964 (Pub. L. 88-352), Section 16 of the Federal Energy Adminstration Act of 1974 (Pub. L. 93-275), Section 401 of the Energy Reorganization Act of 1974 (Pub. L. 93-438), Title IX of the Education Amendments of 1972, as amended, (Pub. L. 92-318, Pub. L. 93-568, and Pub. L. 94-482), Section 504 of the Rehabilitation Act of 1973 (Pub. L. 93-112), the Age Discrimination Act of 1975 (Pub. L. 94-135), Title VIII of the Civil Rights Act of 1968 (Pub. L. 90-284), the Department of Energy Organization Act of 1977 (Pub. L. 95-91), and the Energy Conservation and Production Act of 1976, as amended, (Pub. L. 94-385). In accordance with the above laws and regulations issued pursuant thereto, the Applicant agrees to assure that no person in the United States shall, on the ground of race, color, national origin, sex, age, or handicap, be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity in which the Applicant receives Federal assistance from the Department of Energy.

Applicability and Period of Obligation

In the case of any service, financial aid, covered employment, equipment, property, or structure provided, leased, or improved with Federal assistance extended to the Applicant by the Department of Energy, this assurance obligates the Applicant for the period during which Federal assistance is extended. In the case of any transfer of such service, financial aid, equipment, property, or structure, this assurance obligates the transferee for the period during which Federal assistance is extended. If any personal property is so provided, this assurance obligates the Applicant for the period during which it retains ownership or possession of the property. In all other cases, this assurance obligates the Applicant for the period during which the Federal assistance is extended to the Applicant by the Department of Energy.

Employment Practices

Where a primary objective of the Federal assistance is to provide employment or where the Applicant's employment practices affect the delivery of services in programs or activities resulting from Federal assistance extended by the Department, the Applicant agrees not to discriminate on the ground of race, color, national origin, sex, age, or handicap, in its employment practices. Such employment practices may include, but are not limited to, recruitment, recruitment advertising, hiring, layoff or termination, promotion, demotion, transfer, rates of pay, training and participation in upward mobility programs, or other forms of compensation and use of facilities.

Subrecipient Assurance

The Applicant shall require any individual, organization, or other entity with whom it subcontracts, subgrants, or subleases for the purpose of providing any service, financial aid, equipment, property, or structure to comply with laws cited above. To this end, the subrecipient shall be required to sign a written assurance form, however, the obligation of both recipient and subrecipient to ensure compliance is not relieved by the collection or submission of written assurance forms.

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Data Collection and Access to Records

The Applicant agrees to compile and maintain information pertaining to programs or activities developed as a result of the Applicant's receipt of Federal assistance from the Department of Energy. Such information shall include, but is not limited to, the following: (1) the manner in which services are or will be provided and related data necessary for determining whether any persons are or will be denied such services on the basis of prohibited discrimination; (2) the population eligible to be served by race, color, national origin, sex, age and handicap; (3) data regarding covered employment including use or planned use of bilingual public contact employees serving beneficiaries of the program where necessary to permit effective participation by beneficiaries unable to speak or understand English; (4) the location of existing or proposed facilities connected with the program and related information adequate for determining whether the location has or will have the effect of unnecessarily denying access to any person on the basis of prohibited discrimination; (5) the present or proposed membership by race, color, national origin, sex, age and handicap, in any planning or advisory body which is an integral part of the program; and (6) any additional written data determined by the Department of Energy to be relevant to its obligation to assure compliance by recipients with laws cited in the first paragraph of this assurance.

The Applicant agrees to submit requested data to the Department of Energy regarding programs and activities developed by the Applicant from the use of Federal assistance funds extended by the Department of Energy. Facilities of the Applicant (including the physical plants, buildings, or other structures) and all records, books, accounts, and other sources of information pertinent to the Applicant's compliance with the civil rights laws shall be made available for inspection during normal business hours on request of an officer or employee of the Department of Energy specifically authorized to make such inspections. Instructions in this regard will be provided by the Director, Federally Assisted Programs Division, Office of Equal Opportunity, U.S. Department of Energy.

This assurance is given in consideration of and for the purpose of obtaining any and all Federal grants, loans, contracts (excluding procurement contracts), property, discounts or other Federal assistance extended after the date hereto, to the Applicant by the Department of Energy, including installment payments on account after such date of application for Federal assistance which are approved before such date. The Applicant recognizes and agrees that such Federal assistance will be extended in reliance upon the representations and agreements made in this assurance and that the United States shall have the right to seek judicial enforcement of this assurance. This assurance is binding on the Applicant, its successors, transferees, and assignees, as well as the person whose signature appears below and who is authorized to sign this assurance on behalf of the Applicant.

December 2, 1988
(Date)

(Name of Applicant)
New York University Medical Center

550 First Ave., New York, NY 10016
(Address)

Ira S. Goodman, Director
(Authorized Official)

(212) 340-6703
(Applicant's Telephone Number)