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September 15, 1947

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Biology

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CLINTON LABORATORIES PROGRAM - BIOLOGY DIVISION

The attached outline is a tentative one. We have kept separate the outline for the Mouse Genetics group and Bio-organic Chemistry group. These two groups are now in the process of being organized. The Mouse Genetics group is starting from "scratch." The Bio-organic Chemistry group will be taken over from the Chemistry Division. There are about six organic chemists now working in the Chemistry Division. The plan is to transfer all these men to the Biology Division under the direction of Dr. W. G. Brown.

I - CYTOGENETICS

A research program in cytogenetics is intended to further knowledge of the structure and function of those entities within the cell which are the physical basis of inheritance - the chromosomes and the genes which they contain. Since all genetic variation, and consequently all organic genes and chromosomes, the study of mutation is a central problem of genetics. The most effective agents so far discovered for inducing mutations are radiations. Thus the radiation facilities at Clinton Laboratories offer an unique opportunity for investigating mutation problems. Due to the remarkable uniformity of genetic processes in all types of organisms, information obtained with forms as widely divergent as molds and mice is almost equally significant in evaluating the genetic effects of radiations in men. Results obtained from comparative radiation-genetic studies with different organisms and different radiations may thus be expected and also of some of the factors involved in the interactions of radiation and living matter.

There are several problems which will be completed during the next twelve months:

1) The effect of gamma radiation and slow neutrons and the rate of mitosis.

2) The effects of different types of radiation on mutation production in fungi.

3) A preliminary study on the genetic function of absorbed radioisotopes.

II - BIOCHEMISTRY

Three general classes of problems will be undertaken by this group:

1) A study of the metabolism of nucleic acids in normal and irradiated tissues, and in vitro experiments on the effects of radiation on isolated nucleic acids. These experiments are designed to indicate possible mechanisms of radiation injury to genetic material in terms of altered physical-chemical properties of nucleoproteins and nucleic acids.

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2) Because of the striking sensitivity of bone marrow and testis to radiation injury, the altered metabolic states induced by such injury will be studied. Transamination reactions are probably key mechanisms of protein metabolism and involve a coenzyme, pyridoxine, which exhibits a marked sensitivity to some forms f radiation. For these reasons, transamination will be the first system studied, but other systems, particularly those involved in assimilatory functions, will be investigated. These tissues will also be included in the nucleic acid studies.

3) We intend to continue earlier studies on enzyme systems involved in intracellular protein metabolism, i.e. dehydropeptides and peptides with an amide linkage adjacent to the peptide bond. These systems exhibit extraordinary activity and suggest that the classes of compounds involved are of fundamental importance in protein metabolism.

4) A study is being made of the mechanism of the toxicity of beryllium to mammalian organism through isotopic techniques.

In all this work, advantage will be taken of radioisotopes and stable isotopes.

III - RADIO-BIOCHEMISTRY

The proposed program of the Radio-Biochemistry group is to study the preparation of radio-active sources requiring new techniques, to investigate the chemistry of new problems stemming from the biological application of radio isotopes, and to develop precise and accurate methods of analysis.

A semi-hot laboratory (10 mc level) will be established in which the decontamination of various surfaces and equipment and the preparation of pure beta sources for the irradiation of individual organs and animals will be studied.

The chemistry of beryllium will be investigated with particular reference to its possible toxicity.

Methods for the quantitative separation and estimation of nucleic acids and their components will be developed. This will involve the use of native, P^{32} containing and externally irradiated nucleic acids.

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Re: Program - Biology Division

IV - PHYSIOLOGY AND PHARMACOLOGY

This section, which is oriented toward work of clinical interest, is especially concerned with experimental radiation sickness. It has been demonstrated here that the life of an irradiated rat can be saved by parabiosis, and an intensive investigation of this phenomenon is about to begin. Other studies relating to the cancer problem (radiation as a cause and as a cure; the effect of cell division on radiation sensitivity) will begin later. The section also plans to hold its services ready for collaborative efforts. In particular, work will be planned with the mammalian genetics group, and with radiochemistry (invention of techniques for the application of localized sources of radiation to the internal organs). The section can also serve for clinical liaison.

V - ANIMAL FARM

The work here concerns the preparation and maintaining of animals for the entire Biology Division. This group will work in close cooperation with the Mouse Genetics group.

VI - MICROBIOLOGY

The following programs are under investigation at the present time:

1) The use of radio-active carbon in the study of synthetic activity of propionic acid bacteria. This study is planned in an attempt to get more definite information on the synthetic activity of living organisms. This will lead to an investigation of possible mechanisms with which radiation interferes.

2) The production of mutations in bacteria and bacteriophage.

3) The effects of radiation on photosynthesis, respiration, etc.

4) The development of a new assay method for the detection of stable isotopes.

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Re: Program - Biology Division

VII - GENETICS

It is planned to set up a small genetics group working on drosophila. This organism is very well suited for certain types of radiation study, especially since it will supply chromosomes of a size which can be readily observed under the microscope. It is here that it will be possible to observe directly what happens to chromosomes under the effects of radiation.

VIII - BIOPHYSICS GROUP

In connection with our studies on the effects of radiation, it is necessary to set up a small group of physicists whose main interest lies in devising special devices for measuring radiation and to help us with the physical interpretation of radiation effects.

IX - LIBRARY

It is absolutely essential to the proper functioning of the Biology Division to set up a fairly complete library. We are just in the process of doing this.

X - ADMINISTRATION

Since the Biology Division will be located about eight miles from X-10 area, certain administrative functions will have to be duplicated at the 9207 Building.

XI - MOUSE GENETICS

It is planned to set up an extensive long-term (ten years) mouse genetics experiment. The purpose of this experiment is to determine the inherent changes

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which ionizing radiation will produce on mammalian tissues. An extensive investigation is being conducted by the Atomic Casualty Committee under the auspices of the Atomic Energy Commission to determine the long-term genetical effects of the atomic bomb explosions on man. It may take two hundred years to get definite information on man. It may be possible by properly planned experiments on mice to get this information on mammalian tissues in a five-to-ten-year period. Such an experiment has been recommended by the Atomic Casualty Committee. We are now in the process of setting it up.

XII - BIO-ORGANIC CHEMISTRY

It is planned to take over the organic chemistry group from the Chemistry Division and build it up in our laboratory in the 9207 Building. The function of this organic chemistry section will be to study the mechanism of organic reactions, the synthesis of labelled organic compounds, to make them available not only for the Biology Division, but also for distribution on the Atomic Energy Commission isotope program. It is planned to also set up a small pilot plant for the production of these labelled compounds.

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PERSONNEL

Section	Present			July 1, 1948			July 1, 1949			July 1, 1950		
	Total	Tech.	Non-Tech.	Total	Tech.	Non-Tech.	Total	Tech.	Non-Tech.	Total	Tech.	Non-Tech.
Cytogenetics	16	13	3	22	22	0	25	25	0	25	25	0
Biochemistry	4	3	1	10	10	0	10	10	0	10	10	0
Radiobiochemistry	1	1	0	5	5	0	7	7	0	7	7	0
Physiology and Pharmacology	5	4	1	12	12	0	21	21	0	21	21	0
Animal Farm Caretakers, Janitors	6	1	5	6	0	6	6	0	6	6	0	6
Microbiology	15	12	3	15	15	0	18	18	0	18	18	0
Genetics				4	4	0	8	8	0	8	8	0
Biophysics				4	4	0	6	6	0	6	6	0
Library	1	1	0	1	1	0	2	2	0	2	2	0
Administration & General	7	3	4	10	3	7	14	3	11	14	3	11
Mouse Genetics				5	3	2	15	10	5	15	10	5
Organic Chemistry				10	10	0	20	20	0	25	25	0
Total	55	38	17	104	89	15	152	130	22	157	135	22

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BUDGET

	Building Cost	July - 1948	July - 1949	July - 1950
Biology (Exclusive of Mouse Genetics and Organic Chemistry)	$350,000.00	$470,000.00	$700,000.00	$850,000.00
Mouse Genetics	150,000.00	50,000.00	100,000.00	100,000.00
Organic Chemistry	150,000.00	70,000.00	150,000.00	200,000.00
Total Cost	$650,000.00	$590,000.00	$950,000.00	$1,150,000.00

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	November - 1947					July - 1948					
	No. Personnel	Square Feet of Space				No. Personnel	Square Feet of Space				No. Personnel
		Total		Per Person			Total		Per Person		
		Gross	Net	Gross	Net		Gross	Net	Gross	Net	
Biology (Without Mouse Genetics and Organic Chemistry)	Animal Farm	2,800				Animal Farm	2,800				Anima Farm
	60	30,900	21,630	515	360.5	89	33,870	23,709	380.6	266.4	117
Mouse Genetics						Animal Farm	4,000				Anima Farm
						5	4,000	2,800	800	560	15
Organic Chemistry						10	7,800	5,460	780	546	20

A 30% reduction is made for waste space.

It must be remembered that the space used in the 9207 building is very wastful on account of an excess of very wide corridors, special air-ducts and uneconomical arrangements of previously established laboratories which it would have been very expensive to change.

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- 1949					July - 1950			
Square Feet of Space				No Personnel	Square Feet of Space			
otal		Per Person			Total		Per Person	
oss	Net	Gross	Net		Gross	Net	Gross	Net
800				Animal Farm	2,800			
,870	23,709	289.5	202.6	117	33,870		289.5	202.6
000				Animal Farm	4,000			
000	2,800	266.7	186.8	15	4,000	2,800	266.7	186.7
800	5,460	390	273	25	7,800	5,460	312	218.4

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