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THE UNIVERSITY OF ROCHESTER
SCHOOL OF MEDICINE AND DENTISTRY
POST OFFICE BOX 287, STATION 3
ROCHESTER 20, NEW YORK

ATOMIC ENERGY PROJECT
(ADMINISTERED BY THE DEPARTMENT OF RADIATION BIOLOGY UNDER CONTRACT WITH THE U. S. ATOMIC ENERGY COMMISSION)

2 November 1959

Dr. Charles W. Shilling, Deputy Director
Division of Biology and Medicine
Atomic Energy Commission
Washington, D.C.

Dear Chuck:

Sorry I did not see you but my visit to Washington was brief. You were not in when I called so I write this note regarding my conference at D.A.S.A.

When I received word that the D.B.M. wanted to discontinue our project I decided to "put it down the drain" and not seek other support. But then I received word that the D.O.D. was concerned and wished to explore the possibility of continuing the work. So I saw them.

A list of our interests and problems is enclosed. This was discussed with the group at D.A.S.A. and they indicated a desire to continue some of the projects. Others were outside their area of interest.

I had already taken steps to trim down the project at the end of this fiscal year. The personnel that I had planned to continue into FY '61, to phase out the problem, are those who would implement the work for D.A.S.A., if they decide to pick up the cost beginning FY '62.

Thus it appears to me that no immediate action is indicated and that we should proceed according to plan and await developments. Do you agree?

With best regards,

Herman E. Pearse, M.D.

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HEP/cw
Encl.
cc: Dr. Dunham
Dr. Blair

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MEDICINE, HEALTH & SAFETY - 21 N7 Rochester

Problems which are proposed or are being studied by the Flash Burn Section, A.E.P., University of Rochester are:

1. Thermal Source Development.

If the moratorium on atomic weapon testing continues then we will be completely dependent upon laboratory sources for our results. Three thermal sources have proved effective: the carbon arc furnace, the solar furnace, and ignition of combustibles. Of these, it is our opinion that the carbon arc furnace is the most precise, reliable and flexible. But it suffers from two faults: a small focal spot of about ½ inch of uniform radiation, and the low efficiency of converting only 1% of the electrical power used into radiant power delivered. Experiments now in progress have improved this to a 4 inch spot of uniform radiation with 13% efficiency. More development work is needed before this improvement can be used for laboratory experiments.

2. Radiometric and Calorimetric Instrumentation.

We have developed several instruments for laboratory and field measurement because the interpretation of biological results depends upon accurate physical measurements of the energy applied. More work is needed in this area to devise simpler instruments which would speed up routine calibration of equipment.

3. Damage Prediction.

Information obtained in the past could only be applied to weapon yield or flux used under the conditions of the experiment. We do not understand the basic mechanism of skin burns enough to develop scaling laws for

all conditions. Consequently much work has been done on the correlation of formal mathematical theory with experimental findings. Good correlation has been obtained with non-penetrating radiation (blackened skin) and reliable values of the thermal constants of skin have been established.

But for penetrating radiation (bare, diathermanous skin) serious discrepancies exist between theory and experimental results which need further study before damage prediction can be programmed for machine computation.

4. Prediction of Irreversible Thermal Injury.

The application of reaction kinetics to irreversible thermal injury using Henriques' "punishment integral" has been satisfactory for moderate temperature, long duration thermal exposure (contact burns). But in the high irradiance, short exposure thermal episode of nuclear weapon burns this method is not adequate. Further study is needed for this area of interest in order to obtain practical answers of damage prediction as well as basic information on the response of protein to elevated temperatures.

5. Burns Within Shelters.

Thermal burns occur within shelters as demonstrated on several occasions in field tests conducted with Dr. C. S. White of the Lovelace Foundation. The question is where does the heat come from? We have shown that it is not from scattering of the radiant energy from the fire ball. The next step is to see if hot gases are the cause. For this purpose we have agreed to do the biomedical studies on a program of the College of Engineering and Institute of Optics, University of Rochester, which is designed to study the effect of temperature, velocity and pressure of gases on biological subjects. Nothing is now known of the mechanism or threshold of skin burns by hot gases.

6. The Effect of Superimposing Burns.

Predictions of burn casualties from nuclear weapons and predictions of protection against thermal energy afforded by fabrics have all been based on the assumption that a single weapon would be used. Work has been done on the effects of superimposing two radiant energy, rectangular pulse burns. Work is in progress on the effects of superimposing radiant energy burns produced with thermal pulses simulating a variety of weapons. This will provide the only experimental evidence of the effect on burn severity of superimposing one nuclear weapon burn upon another.

7. The Relationship Between Weapon Size and Burn Severity.

It is well known that if only mild burns are considered, the larger the weapon the greater the radiant exposure required to produce that burn. Evidence to date suggests that scaling laws for more severe burns are completely wrong. Energy required to produce deep second and third degree burns is almost, but not quite, independent of weapon yield. If this is borne out by subsequent experiments, the casualty prediction tables must be revised.

8. Evaluation of Depth of Damage.

When burns from weapons of different yields are considered, surface appearance as a criterion of depth of damage is quite misleading. Burns from smaller weapons may appear deceptively severe; burns from larger weapons may appear deceptively mild. Evaluation of severity of any but very mild burns by other than histologic measurements is unreliable. Simpler methods are needed as are techniques of evaluating full thickness damage.

9. Rate of He[illegible]

The [illegible] of epithelial coverage following a partial thickness burn is determined in part by the type of thermal pulse used to produce the burn. None of the factors influencing the rate of epithelial or dermal regrowth has been determined. Changes in normal tissues adjacent to or beneath burned tissues have been studied histologically. The factors which speed, delay or alter these changes have not been determined. They could be very important in improving the clinical management of mass casualties from thermal burns.

10. Comparison of Human and Animal Burns.

The application of laboratory studies on animals to results in humans depends upon proof of a valid comparison between them. This has been done to a limited extent at the University of Rochester and the Medical College of Virginia. But these results were obtained with mild burns, using a square pulse and were evaluated without histological proof of severity. At present our knowledge of human burns from a bomb shaped pulse of known radiant exposure with histological evaluation of damage consists of sixteen burns on one man. This is not a very valid basis for comparison.

H. E. Pearse, M.D.

BUDGET

I. The Fla[illegible] section of the Atomic Energy Project, the University of Rochester has had a budget of about $120,000 per year including overhead. This varies somewhat depending upon the number of people engaged in special projects. The proposed budget for FY '60 included salaries for 17 full or part time members of the project at $67,000.00, materials and supplies at $20,000.00 and overhead at $34,000.00 giving a total of $121,000.00.

It is not anticipated that this level of effort would be continued by the Department of Defense since some of the work is outside its area of interest. Consequently two other proposals, one with an intermediate, and the other with a minimal budget are listed.

II. Intermediate Budget

The Biochemistry laboratory with Ph.D. chemist and technician are eliminated. One animal room and animal caretaker are eliminated. One surgical consultant and one surgical investigator are terminated, and one vacancy in Biophysics is not filled. The budget is as follows.

H. E. Pearse, M.D. - 1/2 time	$7500.00	
J. R. Hinshaw, M.D., Ph.D. - 1/2 time	5000.00	
M.D., Research Associate - full time	6000.00	
T. P. Davis, Ph.D. - 1/2 time	5000.00	
H. S[illegible], Ph.D., Consultant, Optics	1200.00	
R. [illegible], Ph.D. " , Physics	1200.00	
Res[illegible] Associate, Biophysics - full time	6000.00	
Tec[illegible] " - full time	3500.00	
Secr[illegible] - full time	3600.00	
Total Salaries		$39,000.00
Other costs (equipment, materials, supplies, animals, animal care, travel, etc.)		16,000.00
Overhead		
Total		$77,000.00

III. The minimal budget supports only the Biophysics group with Dr. Hinshaw assisting on medical problems. Dr. Pearse and the M.D. associate are eliminated. The two consultants are terminated and the secretary works 2/3 time. This gives a budget as follows:

T. P. Davis, Ph.D. - in charge - 1/2 time	$5000.00	
J. R. Hinshaw, M.D., Ph.D. - 1/2 time	5000.00	
Research Associate, Biophysics - full time	6000.00	
Technician " - full time	3500.00	
Secretary - 2/3 time	2400.00	
Total Salaries		$21,900.00
Other costs (materials, etc.)		10,100.00
Overhead		
Total		$44,800.00

Budget Summary

	Full	Intermediate	Minimal
Salaries	$67,000.00	$39,000.00	$21,900.00
Supplies, etc.	20,000.00	16,000.00	10,100.00
Net for research	87,000.00	55,000.00	32,000.00
Overhead			
Total	121,000.00	77,000.00	44,800.00

PRIVACY ACT MATERIAL REMOVED

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