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HARVARD UNIVERSITY
MEDICAL SCHOOL
DEPARTMENT OF BIOLOGICAL CHEMISTRY

BOSTON 15, MASSACHUSETTS

July 20, 1947

Office of Naval Research
Navy Department
Washington 25, D. C.

Gentlemen:

I am writing in support of the request by Dr. Alan R. Moritz and Dr. F. C. Henriques for a supplement to contract No. N5ori-76, Project 7, between the Office of Naval Research and Harvard University, for the purpose of studying "Localized Burning of Skin by External Beta Ray Emitters."

In my opinion, this is a very important problem, and Drs. Moritz and Henriques are excellently equipped by training and experience to conduct the work proposed.

A supplement to the present contract is being proposed rather than a new contract, in order that the project may be integrated with the isotope work now being conducted at the Harvard Medical School, and supported by contract with the Office of Naval Research.

The present proposal has my approval as Director of the present contract, and as Chairman of the Committee on Medical Research in Biophysics.

Sincerely yours,

A. Baird Hastings

A. Baird Hastings

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PRELIMINARY PROPOSAL TO OFFICE OF NAVAL RESEARCH

FOR

Supplement to the contract now extant
between the Office of Naval Research and
President and Fellows of Harvard College
under the direction of Dr. A. B. Hastings

I. APPLICANT: President and Fellows of Harvard College

II. DIRECTOR OF PROJECT: F.C. Henriques, Jr., Ph.D., Research Associate in the Department of Legal Medicine, and A.R. Moritz, M.D., Professor Legal Medicine. (by agreement with Dr. A. B. Hastings)

III. SUBJECT:

a. Field of research proposed: An investigation of the effects of beta radiation on the skin and subcutaneous tissue.

b. Work previously accomplished by the institution in field of research proposed: Between 1941 and 1946 the proposers of this project worked under a contract between Harvard University and the NDRC on problems that involved (1) the use of radioactive isotopes in an investigation of the mechanism of cutaneous injury (human and porcine) by mustard and by lewisite, and (2) the establishment of the reciprocal relations of time, temperature and injury production in porcine and human skin. Responsibility for the physical and chemical aspects of these investigations was assumed by Henriques. Responsibility for their biological and pathological aspects was assumed by Moritz. The proposers are experienced in the handling of radioactive material, in its utilization in biological research and in the evaluation of various types of physical and chemical injury in both human and porcine skin. The proposal is sponsored by Dr. A.B. Hastings, Chairman of the Committee on Nuclear Physics of the Harvard Medical School and the contractor with the Navy for the prosecution of research in which isotopes are being used extensively in biologic research. The proposal that this research be done under Dr. Hasting's contract by enlarging the financial allocation now provided not only ensures close integration of this work with other research now going on in the Medical School but will also ensure maximum utilization of existing equipment and technical personnel for its execution.

c. Other research projects, governmental and otherwise, now in progress in the Department of Legal Medicine:

1. The use of radioactive tellurium and the investigation of the toxicity of that element. Dikaio (1) and Jetter.

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(1) Department of Industrial Hygiene

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2. Thermal denaturation of collagen and its relation to the healing of cutaneous burns. Ford.

3. An investigation of the uptake and the release of lipid cholesterol by the lungs. Waddell (1) and McLean.

4. An investigation of postmortem chemical changes in the blood. Jetter, McLean and Nutter.

5. An experimental and clinical pathological study of changes in the adrenal cortex that occur in response to injury and disease. Zamcheck.

6. An experimental study of the effects of increased intracranial pressure on cerebral circulation. Ford.

7. The relation of dietary (protein) deficiency to the susceptibility of the rat to tuberculosis. Lapi and Metcoff (2).

8. A spectrophometric study of the barbiturates. Walker and Fisher.

d. Brief outline of proposed project:

A. Object: As of to date there is remarkably little available information concerning the biologic effects of beta radiation and practically no information concerning the occurrence or nature of cutaneous injury as a function of the intensity and energy of the rays and the duration of the exposure.

Apart from the importance of such knowledge to the basic problem of biological reaction to radiant energy it should have an immediate practical use in establishing safe and dangerous dosage for the many workers in the radioactive field now handling beta ray emitters.

e. Procedure: A large number of radio-isotopes that are now available from the isotope branch of the U.S. Atomic Commission allow a wide selection of pure beta emitters. Through proper choice it is possible to select a particular isotope with a view to irradiating a predetermined thickness of skin. Thus, the selection of carbon-14 with a maximum energy of 0.15 mev will enable a study to be made where the secondary ionization is limited to 0.25 mm. of skin tissue (essentially epidermis), while the selection of potassium-42 which emits a 3.5 mev beta would penetrate about 17 mm. of skin tissue (epidermis, dermis, and fat). Other beta ray emitters which would irradiate intermediate thickness can also be readily chosen.

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(1) Department of Surgery
(2) Department of Nutrition

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The technique proposed would essentially be to place various millicurie strengths of certain radio-isotopes in specially designed shallow cups of about 2 cm. in diameter and of a thickness which would completely eliminate external radiation except that which would be directed toward the skin of the animal. The basic data will be derived from experiments performed on the pig. Previous investigations of cutaneous injury by chemical and physical agents have disclosed remarkable similarity in the reactions and injury thresholds of porcine and human epidermis. After a sufficient amount of animal data are available it is expected that certain critical experiments on human skin will determine the applicability of the animal data to man.

f. Expected duration of project: It is expected that a significant amount of information regarding the tolerance of human skin to beta radiation will be obtained within one year after the initiation of this investigation. It is likely that the desirability of expanding these data and of exploring further the biological effects of beta radiation will cause the investigators to request a renewal of the grant for a second and possibly for a third year.

g. Contractor's present facilities for carrying on proposed research: Space, technical personnel and facilities for animal experimentation either exist or will be provided by the Department of Legal Medicine. Certain facilities for the measurement of radioactive isotopes will be available in the Nuclear Physics laboratories of the Harvard Medical School.

h. Additional facilities for the handling and processing of radio-elements of high millicurie strength can, if necessary, be arranged at the commercial laboratories of Tracerlab, Inc. in Boston.

IV: PERSONNEL TO BE ATTACHED TO THE PROJECT:

a. Scientists and supervisors:

Radiation chemist - 1/3 time
Pathologist - 1/6 time

b. Summary of all other personnel:

Radiation technician - full time
Tissue technician - 1/4 time
Laboratory assistant (animals) - 1/4 time

V: ESTIMATED COST OF PROJECT:

a. Total Cost 13,279.20

b. Proposed salaries of scientists and supervisors described above:

Radiation chemist (F.C. Henriques)
Pathologist (A.R. Moritz)

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. [illegible] personnel:

R[illegible]	full time
[illegible]	1/4 time
[illegible]	1/4 time

. [illegible]rials:

[illegible]: R[illegible]o-isotopes, special designed applicator cups, [illegible] for holding cups, etc. 2,000.00
([illegible] expense - purchase of radio-isotopes of [illegible] millicurie strength from atomic energy [illegible]ation)

[illegible]: Animals, human tissue, incidentals 1,500.00

. [illegible]ment:

R[illegible] measuring equipment 1,500.00*
[illegible] equipment now in operation under the [illegible] things contract is available to this project, this item will not be necessary.

f. [illegible]:

[illegible]sions at 4% of total salaries. 272.00

g. [illegible]:

[illegible]ional overhead at 8-1/4% of total disbursements 995.24
[illegible]ional overhead at 1-3/4% of total disbursements 211.26

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