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SERIES General Corr. (classified) 1956-1957

ACCESSION 181-59-508

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Enclosure (2) to attached Conf ltr of 12 Dec 49 from

Veterans Administration is [redacted].

P.H. -3-213B-
11/29/65

Contains no U.S. Navy Classified Information
IAW OPNAVINST5513.16
Signature: James Cloter CAPT USN
Code: N312Q Date: 15 Feb 95

DEPARTMENT OF ENERGY DECLASSIFICATION REVIEW	
1ST REVIEW-DATE: 2-26-96	DETERMINATION [CIRCLE NUMBER(S)]
AUTHORITY: DADC DADC DADC	1. CLASSIFICATION RETAINED
NAME: B Brown	2. CLASSIFICATION CHANGED TO:
2ND REVIEW-DATE: 1/27/95	(3) CONTAINS NO DOE CLASSIFIED INFO
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VETERANS ADMINISTRATION

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12 December 1949

YOUR FILE REFERENCE:

IN REPLY REFER TO:

Contains no U.S. Navy Classified Information
IAW OPNAVINST5513.16
Signature: [illegible] CAPT USN
Code: [illegible] Date: 14 Feb 95

To: Commander, San Francisco Naval Shipyard

From: G. V. LeRoy, M.D., Director, Biomedical Test Program.

Subject: Proposed NRDL participation in Biomedical Program.

References: a) C-JJ46-11 (977) San Francisco Naval Shipyard.
b) Confidential Memo of Dr. Condit
c) Secret, Proposed NME Biology and Medicine Atomic Bomb Test Projects.

1. Receipt of reference a) is acknowledged.

2. A long conference with Dr. Condit and Dr. Langer was held December 11, 1949, during which all the proposals were examined in detail. No firm committments could be made concerning the program as a whole, since all experimental proposals are required to be reviewed by several groups under the cognizance of the Scientific Director, Dr. Graves. Certain general comments can be made, and certain of the projects can be tentatively accepted.

3. General Comment: The large experiment proposed in reference a) includes a number of elements which have been considered in the past during the development of the present Biomedical Program. Your attention is invited to reference c), a copy of which is enclosed. This memo formed the basis for the considerations of the ad hoc committee appointed by Dr. Warren. These proposals were examined June 7, 8, 9, 1949, and the ones which are not in the current test program were rejected at that time. Thus, in reference c), Project M-2, part d, a study of combined effects was rejected. This is the essence of the proposal in reference a). Also, in reference c), Project M-7, study of therapeutic agents: it was the view of the ad hoc committee that therapeutic studies should not be conducted in the field. This would apply to flash creams, protective clothing, etc. The general opinion was that laboratory studies of such agents could be better controlled and were preferable in the present state of our knowledge. With respect to thermal injury studies (see reference c, Project M-2, b) it was the opinion of the ad hoc committee, and other reviewing groups, that burn studies should be restricted to the examination of phenomena which could be controlled, and which could be used as a guide in the laboratory study

DEPARTMENT OF ENERGY DECLASSIFICATION REVIEW
1ST REVIEW-DATE: 1-26-95 DETERMINATION [CIRCLE NUMBER(S)]
AUTHORITY: DOC DADD 1. CLASSIFICATION RETAINED
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2ND REVIEW-DATE: 4/27/95 3. CONTAINS NO DOE CLASSIFIED INFO
AUTHORITY: ADD 4. COORDINATE WITH: DOD
NAME: [illegible] 5. CLASSIFICATION CANCELLED
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WITH ATTACHMENTS/ENCL

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An inquiry by or concerning an ex-service man or woman should, if possible, give veteran's name and file number, whether C, XC, K, N, or V. If such file number is unknown, service or serial number should be given.

of flash burns. Thus, all proposals relating to general effects of burns, extent of burns, complications of burns by other casualty producing and incidental agents; and all therapeutic studies of burns were rejected. The accepted burn study (see minutes of Burn Conference, Los Alamos, August 14, 15, 1949) is restricted to the production of small burns under rigidly controlled conditions, with subsequent biopsy and histological evaluation.

The Scientific Director, and his associate in J-7 have repeatedly stated that they do not favor an experimental plan which essentially reproduces the actual conditions of exposure to the weapon on a small scale. Practically all of the planning to date has been directed toward the elucidation of certain principles: LD-50, dosimetry, tempo and scale of biologic action, etc., which can be used to guide planning for medical care, and can be useful in further experimentation.

It is my duty to present this proposal (reference a) to the appropriate reviewing groups, but you should be informed that similar proposals have not been accepted during the evolution of the present program.

3. Reference b) is a brief recapitulation of proposed work by representatives of NRDL in connection with various phases of the Biomedical Program. I shall review them serially:

(1) "Mouse LD-50 station layouts" - we are anxious to have as much data on this as possible. In a subsequent conference this whole subject (LD^{50} experiment) will be reviewed. Lt. Bond's ideas are welcomed.

(2) "Mouse Exposure equipment" - the entire problem of the design of <u>all</u> exposure equipment is critical. At the November 14 - 15 conference at Los Alamos it was apparent that considerable controlled planning was required to produce an acceptable design for exposure equipment. Under the authority delegated to me by the Scientific Director, you are authorized to devote maximum effort to the design and development of all types of exposure equipment: mouse, large animal tank modification, etc. A more detailed discussion of this problem will be sent out shortly. It is urgent that sound designs for this type of equipment be produced and prototypes tested not later than February 15, 1950, at which time an evaluation of all proposals will be carried out, and the most acceptable form selected. Good experimental planning is not possible until the exposure units are designed.

(3) "Mouse LD-50 as a function of dose rate". This is a pre-test type of study, the data from which should be valuable in interpreting the weapons LD^{50} data. Suggest that this be correlated with LCDR Cronkite. This has no clear over-seas phase and is the sort of activity that is outside our cognizance.

(4) "Gamma ray energy spectra vs time and distance". So much of this proposal as involves Chamber's phantom dosimetry was approved by J-7 group for the test. Special instrumentation should be reviewed by J-7 and our group.

(5) "Gamma ray scattering vs distance". Same comment as (4).

(6) "Thermal ray energy vs time". This problem should be coordinated with the Scientific Director's program for thermal measurements. The latter's data was to be used for the interpretation of the flash burn studies. This is a new problem, primarily physical and phenomenological. A complete statement of the problem, background, pre-test experimentation and biological application should be submitted for evaluation.

(7) "Thermal ray scattering". Same comment as (6).

(8) "Thermal radiation dosimetry". Same comment as (6).

(9) "Neutron Evaluation". At the November 14-15 meeting, Los Alamos, Dr. Graves stated that one of his groups would perform all neutron measurements required, and supply "reasonable" amounts of material for all animal stations. This is not approved as separate project.

(10) "Manikin development". See paragraph 2 above. This is a new project, and the comments in (6) above would apply. I doubt that it would be acceptable.

(11) "Evasive equipment". This has practical merit. I believe it should be considered as a distinct project, and would appreciate a detailed statement of what the workers propose to do. A somewhat similar project is being developed at NMRI. These will have to be evaluated and approved in the usual manner.

(12) "Large animal thermal exposure strip". The design of the equipment for exposing portions of animals to various components of the thermal flux is a critical matter. Dr. Condit was advised to confer with CDR Lee on this and to review the approved burn experiment plans. I would approve any efforts NRDL could make toward proposing a design for this equipment. This will be evaluated at the conference on exposure equipment in general.

(13) "Motion picture development". This project is related to acceptance of the casualty-study proposed. Its acceptance would depend on the acceptance of the overall proposal.

(14) "Station layout". Same comment as (13).

(15) "Rotating burn subjects". This is a distinct project and should be submitted for evaluation as such. See comment on (6) above. See also paragraph 2.

(16) "Accelerometers". Same comment as (13), also (10).

(17) "Local protective measures". See paragraph 2.

(18) "Widespread protective measures". I believe this is a tactical military problem, outside the scope of the Biomedical Program.

(19) "Secondary shock studies". Such studies were proposed informally at early sessions of the ad hoc committee, and were rejected then for reasons outlined in the minutes. I doubt they would be acceptable now.

(20) "Large animal exposure". This is part of the overall proposal. However, we all concerned with the necessary modification of the large animal tanks tested at Sandstone so that survival under physiological conditions is assured. We would welcome studies and plans by NRDL for the necessary modifications of these structures. This should be done before the the February 15 conference noted above.

(21) "Analysis, etc."

(22) "Balloons". It seems to me that these problems are primarily meteorologic, and are outside the scope of the Biomedical Program.

(23) "Beta and gamma ray hazard". This is primarily a monitoring problem. It is not certain whether the Biomedical Program will operate its own monitors. If so, participation of NRDL would be necessary.

(24) "Animal FP studies". The accepted program does not include any FP studies except on mice accidentally contaminated in the drones. Other species will be protected (presumably) from FP. Tissues and specimens from FP contaminated animals are to be made available to qualified workers. This is Project 2.5.4, and to NRDL should coordinate their work with Dr. Robert E. Carter, Los Alamos Scientific Laboratory.

4. The foregoing analysis of, and comments on, the NRDL proposals recapitulates to a large extent the conversations of Condit, Langer and LeRoy. This memo has been prepared for the information of NRDL, the Scientific Director, BuMED and Dr. S. Warren.

cc:
Captain Behrens
Dr. Graves
Dr. Warren

George V. LeRoy, M.D.
Program Director
Biomedical Test Program

Encl.:
1) Ref. b
2) Ref. c - CDR Fee, only [redacted]

PROBLEMS ASSOCIATED WITH PROPOSED PROPOSAL TO LEROY

(Problems with asterisks are already approved for NRDL participation)

1. Mouse L.D.-50 stations layout*

Preliminary specifications for the arrangement of mouse stations according to distance have been enunciated. V. Bond has pointed out the desirability of modifying this arrangement to allow a more foolproof set of results in case of possible discrepancies from anticipated LD-50 values and distances. The plans for this variation in layout should be completed. It involves closer stations at the larger distances.

2. Mouse exposure equipment

Preliminary plans call for vertically oriented cylindrical units erected on the site like stubby telephone poles. The container will be thermally insulated aluminum alloy tubing probably about 10" in diameter, 10' long (with 5' below ground) and wall thickness about 1/8". A small fan operated from a storage battery will circulate air through the tube. The mouse cages will drop as a unit into the container and will contain food and water. Mice will be segregated in units of 10 - 20 per cage. About 100 mice per installation are contemplated. Thus duplex installations at each station are envisioned. Environmental tests of prototypes of this equipment (with mice) will be run in the Bowser Unit. Blast trials (varying the air impedance) with mice are contemplated at Inyokern (remains to be worked out). Mouse transportation will require the design of suitable handling and moving equipment with controlled environmental conditions.

3. Mouse L.D.-50 as a function of dose rate

Laboratory determinations with the kevatron (July 1950) of the LD-50 for doses delivered in times less than 1 minute. Should a "write-up" be prepared.

4. Gamma ray energy spectra vs time (and distance)

Rough gamma ray energy spectra are desired as a function of time with resolution to about 1/2 second (related to the time required for evasive action). Multiple stations give variation with distance. Already allowed by Chambers' dosimetry program. Needs design and development.

5. Gamma ray scattering importance (vs distance)*

Directional determination of the source of gross gamma radiation to evaluate the importance of scattered radiation. Already allowed by Chambers' dosimetry program. Needs design and development.

6. Thermal ray energy spectra vs time (and distance)

Rough thermal ray energy spectra are desired as a function of time with resolution to about 1/2 second. Muliple stations give variation with distance. Consideration has been given to registration on movie film of the filtered components of the light. Further thought should be given to low power and resolution moving strip infra-red spectrograph. Design and development needed. Needs design and development.

7. Thermal ray scattering importance (vs distance)

Directional determination of the source of gross thermal radiation to evaluate the importance of scattered radiation. Possibilities of multichannel pinhole cameras, or rotating movie camera. Needs design and development.

8. Thermal radiation dosimetry

The development of suitable field apparatus for the determination of thermal radiation dose. To be correlated with animal skin exposures. Needs development.

9. Neutron evaluation

(Questionable whether approved within Chambers' dosimetry) The problem of neutron evaluation and the determination of the accompanying biological hazard seems difficult. However, we would like to give active consideration to it. Needs good basic idea before we determine whether to attempt design and development. Especially important at close stations to verify the supposed freedom from the biological effects of neutrons.

10. Manikin development

Primarily for secondary blast displacement and acceleration studies but very useful for human surface contour effects on burn areas and interesting as human phantoms it is desirable to develop suitable manikins for field test purposes. Clothing store dummies plaster of paris or papier mache are available at $75 to $100 a piece. Modifications required will probably double this cost. At $200 each, 25 of these would still only run $5000 which seems nominal for the benefit of exposure information on pseudo-humans. The most suitable manikins or dummies have to be determined and their adaption to our conditions accomplished. Loading with sawdust for unit density and proper mass, and surface treatment with paraffin droplets whose melting simulates skin burning, are likely possibilities.

11. Evasive action equipment for large animals

Large animal cages and mechanisms for providing exposure to all effects during the epoch from 0 to 1 second only must be devised. Originally the test subjects will be completely exposed. After one second they will be shielded underground. Provision for insuring acceptable environment during the day must be included.

12. Large animal and test material strip exposures to thermal radiation

Continuous uniform velocity strip exposures of animal skin and thermally sensitive material are desirable (maybe uniform velocity not best). Subjects will be completely shielded from thermal effects except that striking the surface through a slit. Motion of slit with respect to the subject is required.

[redacted]

13. Motion picture camera development

Considerable emphasis is being placed on moving pictures of effects on environs, structures and test animals and objects. To insure that these pictures provide the high dividends expected serious consideration must be given to their installation, shielding, scene lighting and synchronization. Cameras and film must also be obtained.

14. Station layout

Most of the features of the NRDL proposal will be concentrated at a few stations. The physical arrangements of these stations deserves careful planning to provide maximum information with economy of effort and equipment. The possibilities of recording events with the motion picture cameras should be consistently exploited. The original orientation of test objects must be well conceived. (Some animals have eyes exposed, some manikins are standing, prone or squatting.)

15. Rotating burn subjects and receivers

(Combine with 12?)
Equipment must be devised for rotating large animals to determine relation of burn intensity and area damaged. (Seems like a laboratory study. Field demonstration of value?)

16. Accelerometers

For secondary blast studies on large animals and manikins suitable accelerometers must be obtained or devised.

17. Local protective measures for thermal skin damage

Hair, moisture, creams, clothing, filters, etc., for local application and of possible protection must be specified and obtained.

18. Widespread protective measures for thermal skin damage

Smoke generators should be obtained and tested for effectiveness.

19. Secondary shock studies within structures

Suitable manikins developed for secondary blast experiments should be placed in and about structures erected by other groups for blast resistance studies. Coordination with Bureau of Yards and Docks or Army Engineers should be developed.

20. Large animal exposure equipment

The dogs and pigs subjected to the combined exposures will be generally unprotected from the specific effects--however suitable environment, confinement and initial orientation must be provided. Chief concern is to

provide blast-resistant shade for shelter from the tropical sun. The subjects are enticed or forced out from this shelter at zero and after the effects are over will be free to seek shade as they wish and are able to. Permanent shade may be provided (a) by reinforced concrete decks elevated and braced by steel supports or (b) sections of large reinforced concrete pipes 1/2 submerged axis parallel to the terrain and grouted in the ground. (Could exclude subjects by covering ends of pipe with paper or cloth which would be blown away by blast allowing entry.)

21. Analysis of environmental corrections and measures to furnish

Events found to occur on a tropical coral island can vary considerably from events which would be expected in other climes and locations. A serious effort should be made to (a) examine events likely to be independent of locale and (b) make measurements allowing the extension of the observed results to other situations of interest. Must determine the effects of cloud chamber, dust cloud, sand storms water spray, beach and sea reflection and atmospheric conditions. Photographic measurements of known lights as transmitted through intervening space is important. Possible elevated stations (towers, ballons) may clarify ground level perturbations.

22. Development of suitable ballons

The possibility exists of readily obtaining significant information on effects with properly designed and calibrated balloons. Toward this end, consideration should be given to obtaining airborne balloons with the desirable properties of compressibility, tensile strength, high temperature resistance and absorption of thermal radiation.

23. Development of suitable field standards for beta and gamma ray hazard analysis*

NRDL problem assignment 161 should develop the general features of the requisite instruments. Special development of field instruments is required. Procedures must be conceived for attempting the experimental determination of the relative hazard of beta to gamma radiation from suitable extended sources provided by fission product contamination. A Post-Short experiment requiring portable equipment but no installation. If suitable contamination is found the investigation will be attempted. If not found, nothing will be attempted.

24. Animal experiments (post-shot) for evaluating relative beta to gamma hazard from fission product contamination.

To be performed like 23 above if suitable extended contamination is found. Any ideas?

25. Island Controls

001652B [redacted]

PROPOSED NME BIOLOGY AND MEDICINE ATOMIC BOMB TEST PROJECTS

no copy include with CM Fee's

Project M-1 - Early pathological changes in radiation illness.

Objective: To obtain animal tissues for pathological study during the first 24 hours following exposure to intense ionizing radiation.

Method: The experimental design anticipates the use of equipment developed under Project 7.1-17/RS(BM)14 at Eniwetok during Operation SANDSTONE. Four (4) animal tanks suitable for pigs or dogs were tested on land and on floats off-shore during tests X-RAY and Yoke. The tanks on rafts were least damaged and most readily recovered. It is planned to place about 24 animals per test in 12 tanks on floats to be anchored off-shore at distances from about 400 to 700 yards. These tanks are to be recovered as soon as possible after detonation and the animals autopsied at predetermined time intervals during the first 24 hours.

Justification: We have little information regarding the early pathological changes in radiation illness. It cannot be obtained from either the Japanese or Bikini data or in the laboratory except with great difficulty. The contemplated experiments will furnish information in this phase of the radiation illness problem.

Project M-2 - Relation of distance and physical data to morbidity and mortality in animals.

Part a. Air blast study.
Part b. Thermal radiation study.
Part c. Ionizing radiation study.
Part d. Combined effects.

Objective: The objectives of this project are essentially four-fold and relate to the subdivisions of the title, Parts a, b, c, and d. An attempt will be made to determine the relative importance of blast, flashburns and ionizing radiation with regard to morbidity and mortality in several animal species such as mouse, rat, guinea pig, rabbit, dog, and pig. The individual objectives are as follows:

a. To study direct air blast injuries in several animal species with regard to peak pressure and duration of shock wave, also mechanism of injury.

b. To study the relation of mortality to surface area and degree of burn. To correlate the pathological skin changes with the intensity and quality of the thermal radiation. To compare the physiological changes in skin produced by atomic bomb flashburns with laboratory produced flashburns.

c. To study the effects of ionizing radiation upon several animal species at various distances from the bomb explosion and to correlate these effects with intensity and quality of the radiation. Also to compare the known mortality of the various animal species from 1,000 k.v. X-rays to that of atomic bomb ionizing radiation.

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NO. 3 OF 30 COPIES, SERIES A

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d. To investigate the combined effects of blast, thermal and ionization radiation upon similar groups of several animal species as used in Parts a, b, and c. An attempt will be made to determine the contribution of each of these factors to morbidity and mortality by differential comparison.

Method: It is planned to expose large groups of several animal species to give statistically reliable data under the following four experimental conditions.

a. Exposure to primary air blast injuries in cages designed to give protection against thermal and ionizing radiation.

b. Exposure to thermal radiation in cages designed to protect against blast and ionizing radiation. These studies will include the susceptibility of flashburns complicated by ionizing radiation to various organisms as staphylococci, streptococci, and clostridium species.

c. Exposure to ionizing radiation providing complete protection against blast and thermal radiation.

d. Exposure to the combined effects of air blast, thermal and ionizing radiation in cages designed to give indirect blast injury protection only. Studies will also be made of the normally occurring bacterial flora of the respiratory, gastro-intestinal and mucous membrane surfaces of these animals.

After exposure the various groups of animals will be removed as soon as possible and returned to the breeding colony (see Project 6) for study and disposition. Most of the animals will be autopsied at predetermined intervals to follow the physiological and pathological changes related to the several types of injury. It is anticipated that few, if any, animals will be returned alive to the United States. However, a very large number of tissue specimens will be preserved for study. It will be necessary to autopsy a rather large number of dead animals immediately upon recovery. It is considered that this can best be done aboard the laboratory ship (see paragraph 4). These studies to include the bacterial examination of the respiratory and gastro-intestinal tracts.

Justification: Carefully controlled and statistically reliable tests correlating animal morbidity and mortality with type of injury and distance are indicated in order to relate laboratory and field test data. The Bikini tests are inadequate for this purpose since too few animals were located at any one station and factors other than distance varied markedly from station to station.

Comments:

Part a. Cages suitable for the exposure of animals to direct air blast effects were developed at Inyokern under the direction of Captain R. H. Draeger prior to Bikini. Modifications to isolate the injurious factors are planned together with further testing of the equipment.

Part b. The thermal studies at Bikini and Eniwetok form the background for this investigation. Collaboration has also been arranged with Dr. H. E. Pearse, University of Rochester, who will assume the major responsibility of the flashburn study and supply several assistants.

[redacted]

Parts c and d. The extensive studies of the Bikini animals and lethal dose studies in various animal species at NMRI will be invaluable in these phases of the radiation illness study. A strain of mice is being bred at the NMRI which is hardy, prolific, and presents a uniform response to 1,000 k.v. X-rays. Comparable rat, guinea pig, rabbit, dog and pig breeding stock can be obtained.

Project M-3 - Effects of ionizing radiation on biological warfare agents.

Objective: To study the reaction of B.W. agents to atomic bomb ionizing radiation with respect to survival and genetic changes.

Method: Selected B.W. agents will be prepared by the Chemical Corps, Camp Detrick, for exposure to atomic bomb ionizing radiation. This material will then be exposed in containers similar to those used during Operation SANDSTONE. Upon recovery this material will be removed to an isolated laboratory for study.

Justification: Since B.W. agents and A.W. agents might be employed together, it is important to determine the effects of ionizing radiation upon B.W. agents. It is known that a heavy dose of ionizing radiation (25 to 50,000 r) will kill a large percentage of most bacteria. However, little is known regarding the virulence of the surviving organisms or the effect of smaller doses of radiation on the particular organisms under consideration.

Comment: Experience with the packaging of biologic materials both at Bikini and Eniwetok make possible the exposure of this material without hazard. None of the containers used at Eniwetok were broken open in spite of having been placed very near to the bomb explosion.

Project M-4 - Effect of ionizing radiation on resistance to B.W. agents.

Objective: To study the reactions of experimental animals receiving sublethal amounts of ionizing radiation to B.W. agents with respect to resistance to infection and pathological changes.

Method: Normal experimental animals will be exposed to sublethal doses of atomic bomb ionizing radiation and then exposed to B.W. agents in isolated laboratory.

Justification: It is known that the susceptibility of laboratory animals to certain bacterial infections is increased by total body irradiation. Also one of the serious complications of radiation illness is secondary infection. These facts suggest that B.W. agents may be more effective if combined with sublethal doses of ionizing radiation. It is possible that small doses, producing little or no symptomatology, may exert a marked effect on susceptibility to comparatively non-virulent organisms. This project is planned to investigate these problems.

Project M-5 - Effects upon B.W. agents - simulants.

Objective: To expose simulated B.W. agents to the effects of an atomic bomb explosion (blast, thermal and ionizing radiation).

[redacted]

Method: It is planned to expose simulated B.W. agents (harmless organisms) as a contamination of building surfaces, plants, soils, etc., to atomic bomb effects at several distances and afterwards collect samples for culture. A minimum of effort will accomplish this project. No complicated logistics are involved.

Justification: This project supplements the information expected from projects M-3 and M-4. It is desired to emphasize the possible important relations between A.W. and B.W. These projects should be rationally considered and not dismissed because of fear of B.W. agents.

Project M-6 - The effect of ionizing radiation on oral tissues and structures.

Objective: To determine the pathologic effects of ionizing radiation on oral tissues and structure including the jawbone, teeth, dental periosteum, dental pulp of experimental animals on a normal and cariogenic dietary regime.

Method: It is planned to study the oral structures of animals exposed to ionizing radiation as outlined in Projects No. 1 and 2. Some animals kept on a cariogenic diet will also be exposed and studied.

Justification: Since oral tissues are known to be affected in radiation illness, it is desirable to make an extensive study of these pathologic changes.

Project M-7 - Effectiveness of therapeutic agents upon radiation illness.

Objective: To evaluate the effectiveness of various therapeutic agents upon the histologic changes and mortality in animals exposed to atomic bomb ionizing radiation.

Method: It is planned to utilize part of the animals exposed under Part c. of Project M-2 for the evaluation of therapeutic agents of possible value in radiation illness including antibiotics, intestinal antiseptics, dietary factors such as high and low vitamins etc. Also additional therapeutic agents which may be demonstrated to be of value during the next two years. The untreated animals of Part c. Project M-2 will serve as the controls for this study.

Project M-8 - Study the hemorrhagic phase of radiation illness.

Objective: To evaluate the relative importance of vascular injury, thrombocytopenia, circulating anticoagulants and toxemia in the production of the hemorrhagic syndrome of radiation illness.

Method: Animals irradiated under Part c. of Project No. 2 will be used for this study. This investigation will include the usual clinical procedure for the study of hemorrhagic disease and in addition special technicues such as plasma fractionation for the isolation of plasma anticoagulants.

Project M-9 - Animal [illegible] at Eniwetok.

Objective: To rear laboratory animals habituated to the tropical environment of Eniwetok for the forthcoming atomic bomb tests (see Projects M-1 to M-4).

[redacted]

[redacted]

[redacted]

Method: It is planned to establish an animal breeding colony on one of the islands near Eniwetok island perhaps Japtan during the summer of 1949 for the puspose of raising laboratory animals of several species for the atomic bomb tests in 1951. The species contemplated are the mouse, rat, guinea pig, rabbit, dog, and pig.

Justification: Experience at Bikini has shown that the transportation of laboratory animals into the tropics produced marked physiological changes such as variation in the red blood cell counts which make the interpretation of experimental data very difficult. Animals rasied under tropical conditions would be more satisfactory, also steps could be taken to habituate the animals to the particular environmental exposure to which they would be subjected during the exposure to atomic bomb effects.

Project M-10 - Effect upon flora and fauna.

Objective: To study the effects of atomic bomb thermal radiation upon the animal and plant life such as birds, insects, and various plants.

Method: In order to implement the objective of this project arrangements have been made with agencies such as the Smithsonian Institute and Department of Agriculture to furnish qualified personnel to survey various forms of life before and after the bomb detonations. To be included are Invertebrate Biologist, Botanist, Entomologist, Ornothologist, Bacteriologist, and Microbiologist.

Justification: Marked effects were noted upon certain of the plant and animal life at Eniwetok. For example: hundreds of birds were grounded due to the singeing of the wings, the leaves of plants and trunks of trees were scorched in varying degrees. It appears likely that a survey of the effects of atomic bomb thermal radiation likely that a survey of the effects of atomic bomb thermal radiation upon plant life serve as a valuable guide to the location and tonage of an atomic bomb explosion. No systematic study of these effects has, as yet, been made.

Project M-11 - The exposure of selected biologic material.

Objective: To expose selected biologic material such as seeds, insects, moulds, enzymes, hormones, etc., to atomic bomb ionizing radiation.

Method: It is planned to construct containers similar to those used at Eniwetok to expose a variety of biologic material as above enumerated.

Comment: This project will include material from the NRDL, the NMRI, and USDA. Space will be available to expose material desired by other groups for study as was done for various collaborators at Bikini and Eniwetok.

Project M-12 - Uptake of radioactive material by plants and animals.

Objective: To determine the amount of uptake of radioactive material by plant and animal life [illegible] contaminated by an atomic bomb explosion.

Method: It is planned to study various forms of plant and animal life in the contaminated area with respect to uptake of radioactive substances. This will be accomplished by the sampling of the naturally occurring forms of life such as plants, insects, and birds.

[redacted]

[redacted]

[redacted]

Comment: The responsibility for certain phases of this project will be assumed by the USDA who will supply [redacted]ral personnel.

Facilities: In order to implement the projects the following facilities will be needed. It is expected that these facilities will be jointly used by NMRI, NRDL and other collaborators mentioned in connection with the various projects. These facilities would also be available to other investigators desiring to extend the scope of these studies.

a. Animal breeding colony. See Project M-9.

b. Biological laboratories on same island as (a).

c. Laboratory ship - this laboratory would include both physical and biological laboratories and be shared by NRDL, NMRI, and other collaborators.

d. Isolated laboratory - this laboratory is to be used by the Chemical Corps for projects M-3 and 4. There is no plan to contaminate this island, the isolation being merely a safety precaution since B.W. agents will be handled.

[redacted]

[redacted]