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AND STUDIES OF MARSHALL ISLANDS

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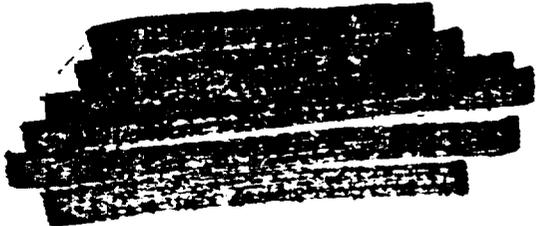
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5 CONFERENCE ON LONG TERM SURVEYS :
6 AND STUDIES OF MARSHALL ISLANDS. :
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8 Room 1201,
9 Temporary 3 Building,
10 Washington, D. C.
11 Monday and Tuesday, July 12-13, 1954

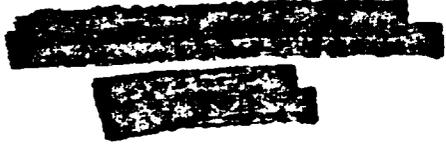
12 The Conference convened at 9:00 o'clock a.m.,
13 Dr. John Bugher, Division of Biology & Medicine, Chairman.

14 PRESENT:

- 15 DR. JOHN BUGHER
- 16 DR. C. L. DUNHAM
- 17 DR. G. DUNNING
- 18 DR. W. CLAUS
- 19 CDR. E. P. CRONKITE
- 20 CDR. R. A. CONARD
- 21 MR. GEORGE IMIRIE
- 22 CDR. H. ETTER
- 23 DR. V. P. BOND
- 24 MR. H. HECHTER
- 25 DR. C. SONDHAUS
- LT. R. SHARP
- LT. COL. L. E. BROWNING
- MR. P. HARRIS
- MR. S. H. COHN
- MR. J. HARLEY
- LT. SHULMAN
- CAPT. YARBROUGH, MC, USN
- CAPT. ENGLISH, USN
- LT. CHAPMAN, USN
- LT. LOONEY, USN.
- MAJ. HANSEN.



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P R O C E E D I N G S

DR. BUGHER: It falls to me to start things off.

First of all, according to our records, everybody is Q
cleared except one gentleman who in the short time we could
not put through a special clearance. On the other hand,
while we have to observe the technicalities of the situation,
AEC would not have them communicated restricted data. So we
may have to observe a certain silly routine at times. I
don't think actually we get into much in the way of restricted
data. Among the military we can discuss restricted data
anyway. We may have to observe that minor formality since
there was not time to arrange a special clearance.

As far as the purpose of the conference, which
you all know, I would repeat that our major purpose is to
assist in bringing together all the pertinent data and
executing the necessary analyses of that data of the study
of the persons who were injured by the fallout of the March
1 shot among the Marshall Islanders. That includes also
certain task force personnel who were exposed at that time.

The situation of course is a unique one as far
as past history is concerned, because we have no similar
episode previously in which whole body gamma radiation
combined with extensive skin contamination has been observed in
a large group of people resulting from mixed fission products.
The only other group of people were involved in the same

1 detonation, the crew of the Japanese fishing craft, which
2 was about 50 miles north and somewhat west of Rongelap Atoll,
3 and was caught in the fallout, apparently being to the
4 north of the main line of concentration.

5 So that although these people do not come into
6 this particular discussion to any great extent, it appears
7 that the Japanese had somewhat of the same magnitude of whole
8 body exposure as the Rongelap people did, but with somewhat
9 more skin lesion as a result of a longer period of contact
10 with the skin surface, due to poor washing, fundamentally.

11 The larger group of people are those with whom
12 the special medical team dealt. This report, which is
13 being evolved, will be an extremely important one from the
14 standpoint of the medical information and will be a guide
15 unquestionably in many of the military considerations of the
16 effect of radioactive fallout material.

17 There is another large element in the picture
18 and that concerns the international relationships which have
19 been thrown into considerable focus by this event. During
20 the last three days of last week, I had to sit with the
21 United States Delegation at the UN because this matter is
22 now a subject of rather violent and acrimonious discussion
23 in the Trusteeship Council. The United States under the
24 trusteeship agreement of 1947 holds the Pacific Islands in
25 trust, among them being the Marshall Islands. That mandate

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1 is administered by a special trusteeship organization,
 2 actually under the Department of Interior now. It was
 3 formerly under the Navy. As such, it is responsible to
 4 the United Nations and under the original terms, the United
 5 States held the right to withdraw such lands as might be
 6 necessary for strategic and security purposes, but beyond
 7 that, to administer the whole area for the benefit of the
 8 people concerned.

9 Bikini, of course, was separated from the islands
 10 of free access before the trusteeship agreement was reached.
 11 Eniwetok was separated about that time. But in view of the
 12 commitments that the United States entered into voluntarily
 13 at that time, there was unanimous approval of the trusteeship
 14 by the United Nations Trusteeship Council.

15 Now we find that this is being used as one of the
 16 weapons in the war of maneuver. The Marshall Islands
 17 petition, which was sent in by a group, particularly
 18 at Majuro, is used as a club now to establish a case that
 19 the United States has been false to its obligations as a
 20 trustee; that it has deliberately destroyed lands belonging
 21 to the people governed; that it has injured them in a series
 22 of experiments where, quoting various Congressmen and high
 23 American officials, we documented that not only did the
 24 meteorologists find themselves unable to predict anything,
 25 but the scientists were unable to anticipate what would happen,

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1 being greatly astonished by the results of what they had put
2 together.

3 This is the theme being pushed by the Communist
4 group particularly, largely comprised of the Soviet Union,
5 India and Syria at the present time, in an attempt to get a
6 resolution adopted which is condemnatory of the conduct by
7 the United States of the trusteeship of the Pacific islands.

8 One of the strong points in this situation is that
9 in fact nobody did die, and all the people have apparently
10 recovered very satisfactorily. Movie films are available in
11 New York showing the relocation of the Rongelap people on
12 Madro Atoll in a very beautiful setting in which the new
13 houses are located, the people obviously happy and healthy.
14 The Uterik people also shun returning to their homes. So
15 far I think that film has not been shown because there was
16 an agenda wrangle immediately which would defer this film
17 showing until later in these hearings.

18 So that is the atmosphere which exists in the UN
19 in which this whole thing is being used as a diplomatic
20 weapon. We are fortunate, indeed, that the prompt response
21 of the medical groups concerned was so effective in insuring
22 the medical care of these people, and that the whole thing
23 has turned out so happily, as far as the welfare of these
24 people is concerned, apart from the human concern that one
25 does not like to be responsible for injury to anyone.

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There is a very significant international issue involved here, with the fundamental argument concerning the rights of the trustees.

So that is somewhat the atmosphere in which we are working, and one of the reasons why it is important to get this report, not only in the very best scholarly form that we can achieve, but also to do so in a minimum of time. Eventually I hope we can also declassify the report, so as to have it published as a piece of medical literature with much medical importance to Civil Defense, to people interested in radiation injury, and a lot of other things. So I think we will realize that everybody in the government concerned with this problem is really very grateful to the group that carried on this investigation so effectively and achieved a very high order of scientific cooperation which existed throughout the program. Everyone who was asked to do something did so with very good will and enthusiasm, and turned in the very best job he could. There was no scrambling for position or notoriety in any way. I think it was one of the most satisfactory efforts that anyone could wish for.

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You realize, of course, that the study and the report which you will produce is only the beginning; that the report which is in progress of preparation is only Chapter 1 of a larger volume whose termination cannot yet be foreseen.

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1 In other words, these studies will have to continue for
2 an indefinite number of years. We hope that even after
3 several years, that we will see pretty much the same group
4 of people still interested in this problem, and actively
5 working on it.

6 We will some time later get to the means by which
7 we hope to carry on the program and to get on with the studies
8 through the succeeding years. Despite the fact that everybody
9 has recovered now, and looks hale and hearty, naturally we
10 have certain reservations about what may happen in the course
11 of 15 to 20 years with skin areas, which have been affected
12 by as much radiation injury as occurred here, and whether
13 or not we will find spermocel carcinoma, one of the long
14 term sequellae of the lesions. I do not know. It is a
15 matter of speculation. But obviously it is one of the things
16 that may give concern.

17 Captain Yarbrough, have you any additional comments
18 that you care to make at this time before we get every body
19 to work?

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20 CAPTAIN YARBROUGH: I have nothing particularly,
21 Dr. Bugher, except that this particular incident has
22 brought to light the fact that it is quite difficult to keep
23 together personnel in the form of a unit that can be quickly
24 activated and transported to distant places for studies of
25 this kind. I am sure that all people in the military at this

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1 and Dr. Dunning, and I think I will leave that for him to
2 summarize.

3 There are minor differences in the approaches and
4 also the numerical values of the parameters, but these do not
5 seem to lead to any sharply different values. I think that
6 is all I have to say.

7 DR. DUNNING: As the group can appreciate, there
8 is a great deal of uncertainty in trying to estimate the
9 numbers. Different instruments were used by different people
10 at different times, and different places. Some instruments
11 were calibrated recently before use, some were not. In
12 addition to the actual surveys taken, of course, theoretical
13 computations were made, such as the ratio of formation of
14 Neptunium and fission products for this particular device,
15 being of the order of .8, for example, and then trying to
16 estimate what the relative dose rates would be at different
17 times after detonation and trying to come up with an
18 integrated dose for the times of interest.

19 In the case of Rongelap natives, the fifth or sixth
20 hour after the fallout to the time of evacuation, there was
21 still some uncertainty as to the exact time of initial
22 fallout, even uncertainty as to Neptunium contribution,
23 uncertainty as to where the people were. We had different
24 dose rate readings at different parts of the island. Where
25 were the natives? How long did they stay there? Different

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1 dose rate readings inside and outside, but in the case of
2 natives that was not so important, because in the huts the
3 dose rate readings are almost as high as outside.

4 In the metal shacks for the Air Weather people
5 at Rongerik, this was not so. We have such phenomena as people
6 lying on their mats for their sleeping at night, the fallout
7 material blowing into the huts, thoroughly covering the huts.
8 The uncertainty of the contribution of the soft gamma.
9 As you know, most of these measurements are taken by such
10 instruments as the T-1-B or T-39, where they have essentially
11 a cutoff value of some 70 to 80 OEV . You are missing your
12 soft gammas and your beta.

13 Then I think there is one phenomenon that was
14 not discussed very much, but which may be important.
15 Unfortunately we cannot evaluate it. We have experienced
16 this phenomenon in the Nevada test, for example, in Shot
17 No. 9, in the Upshot-Knothole series. When you plotted out
18 the dose rate readings with time, you get a definite hump.
19 In that case the area under the curve was not too great or
20 significant. But out in the Pacific, where you certainly had
21 a relatively high concentration of activity in the air,
22 lasting for probably many hours, you might have a
23 significant contribution from sky shine that has not and
24 probably never can be accurately evaluated. This will not
25 show up in any of our dose rate readings.

1 I told you we are going to have a lot of "ifs"
2 and "ands" but we are still going to come up with numbers
3 in the end.

4 So taking all these values, the values arrived at
5 theoretically, values taken by the survey team, using the
6 various exponents and so forth, it would appear that the
7 best estimate we can make for the Rongelap natives was about
8 150 r. This is whole body gamma. This does not include
9 soft gammas, nor the betas. At ^{Alikani} Elinkani, the data are less
10 firm, but be that as it may, our estimate is about half, or
11 in other words, about 75. Utirik, again, is less firm than
12 Rongelap, but we are not quite so concerned that it is less
13 firm inasmuch as it would appear that the value is about 15 r.
14 In other words, we are not concerned in terms of any
15 biological hazard.

16 For the Air Weather people on Rongerik, again
17 we have a whole series of survey data, as well as the film
18 badges. After going overall the survey data taken by
19 various instruments at various times and different
20 people, and what have you, it would appear that the firmest
21 data is to go to the film badges. As you know, some of these
22 film badges were in an ice box and some were carried. But
23 for most of the personnel, the film badges were between 40
24 and 50 r. For one film badge, representing three Army
25 personnel on the north end of the island, their film badge

1 taken from aboard the ship. I repeat it is very limited.
2 But be that as it may, making certain assumptions, it would
3 appear that if the fallout material were to remain in contact
4 with the skin of the Japanese fishermen for one hour, that
5 something of the order of 10,000 REPS would have been
6 delivered to a depth of 7 milligrams per square centimeter.
7 And if it remained longer than one hour,, which it probably
8 did in ~~te~~ case of the fishermen, on up.

9 In the case of the natives, we don't even have
10 that much data to go on. The fact that the natives were
11 lying down during the evening of March 1, probably contributed
12 to exposing a larger surface of the body to the soft gammas
13 and betas. But to come up with any firm number as these
14 natives received so many REPS, we felt we were unable to do so.
15 The data would certainly strongly support the conclusion
16 that these lesions were due to radiation. Of that there seems
17 to be little doubt. But exact doses I just cannot say.

18 DR. BOND: Can you give us any estimate of the
19 amount of gamma below KV cutoff?

20 DR. DUNNING: Yes. Dr. Sondhaus, will you tell us
21 that?

DOE ARCHIVES

22 DR. SONDHAUS: Yes. I would like to say that the
23 estimates we have do include the contribution of gamma
24 below 100 KV in the initial spectrum which we have.
25 Approximately 8 per cent occurred below 80 KV. When you

1 differ between these two cases if you normalize to the same
2 air dose between the laboratory exposure and the field
3 exposure.

4 DR. BUGHER: Do you think with your gamma spectro-
5 metry you will come out with some sort of estimate here?

6 DR. SONDHAUS: That is quite possible, I think.

7 DR. BUGHER: That is the essential thing. We are
8 not only uncertain as to 150 r; we do not say that the
9 individual's bone marrow or organs or spleens got such
10 radiation; is that right? How long do you think it is going
11 to be before we do come out with a pretty firm estimate?

12 DR. BOND: I think before the final report, Dr.
13 Bugher, we are working with it on our x-ray machines, and
14 the cobalt source that is ideal for solving this problem, and
15 it will probably be solved before the final report is in.

16 DR. BUGHER: Obviously it is a very important
17 figure to have, and as precise as may be possible. That is
18 a very helpful comment.

19 Are there any other comments or questions to ask
20 of this committee? If not, we pass to the second group
21 report by Dr. Bond on the clinical aspects which include the
22 hematologic things, as well. DOE ARCHIVES

23 HEMATOLOGIC, SKIN, AND GENERAL CLINICAL STUDY

24 DR. BOND: I think perhaps we had less uncertainties
25 in our material than the dose group. Obviously the dosage

1 problem is of tremendous importance to us in an effort to
2 correlate what we saw with physical estimates of dose.

3 I think we will simply enumerate the major conclusions that
4 we wish to draw from this study. If there are comments, I
5 would like to have them at the time, so please interrupt.

6 I think as far as systemic effects are concerned,
7 the only symptoms that could be ascribed unequivocally to
8 radiation was the early appearance of mild subjective
9 symptoms. This was nausea that appeared to a large degree
10 in the Rongelap people, and with considerably less degree in
11 Ilinkela, and not at all in the Uterik or American groups.

12 These people were treated identically. They did
13 not know, so to speak, the correct answers to the questions
14 that were put to them. Different interrogators obtained the
15 same results, so we feel that this is a real thing, and
16 probably ascribable to radiation.

17 Aside from this, there were no other clearcut
18 constitutional symptoms ascribeable to radiation. There was
19 no diarrhea or other classical symptoms of whole body radiation
20 damage. The instance of cold diarrhea and so forth was
21 equal in the different exposure groups. DOE ARCHIVES

22 There is one possible exception to this statement.
23 Abnormal menses were observed in two women in the Rongelap
24 group. Whether this can be ascribed to radiation is a
25 considerable question.

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1 An additional point is that it was impossible for
 2 the observers to distinguish among the various groups with
 3 regard to the activities, that is, the spontaneous activities
 4 they carried on. That is, apparently they played and engaged
 5 in the same amount of activity throughout the period of
 6 observation.

7 So much for the constitutional symptoms. As far
 8 as the skin lesions are concerned in these people, there was
 9 early appearance of itching of the skin, itching and burning,
 10 and here again a very large instance in the higher exposure
 11 group, less in the lower exposure groups. There were no
 12 further symptoms until the development of the lesions which
 13 I will go into in a moment.

14 The question has been brought up as to whether
 15 these are beta lesions or chemical burns. I don't think we
 16 need to dwell on that except to state that it is the very
 17 definite feeling that there is no possibility that they are
 18 chemical burns, and they were due to exposure to ionizing
 19 radiation.

DOE ARCHIVES

20 The second large point we would like to make is that
 21 these were contact burns and were not derived from a field
 22 of radiation. It was only in areas where there was actual
 23 contact of the fallout material with the skins that the
 24 lesions developed or in areas where there was a chance for
 25 the fallout material to be directly in contact with the skin.

1 This is borne out by the fact that in general where clothing
2 covered the body, even a light dress in the case of the
3 women, burns did not appear. It is also borne out histo-
4 logically by the fact that there are islands of normal tissue
5 in between the several affected tissue, indicating the
6 particular nature of the deposited material, and the fact
7 that it was deposited material that was responsible for the
8 burn.

9 One thing that is not clearly worked out, and I
10 don't know how to explain this. Apparently there is some
11 discrepancy or difficulty explaining the order of appearance
12 of lesions. Generally speaking, the lower the dose, of beta
13 radiation, the later the lesions would appear.

14 This in general was not entirely the case with
15 these individuals. The feet, for instance, showed very
16 severe beta lesions. The surface of the anacubicle foci,
17 the anterior surface of the neck, showed beta lesions.
18 The scalp and the feet where the skin presumably is thicker
19 sometimes lesions appeared later, and were more severe than
20 in the case of the areas with thinner skin. DOE ARCHIVES

21 Also the order of appearance of these lesions
22 in general was different from some reports in the literature.
23 Also this was apparently a monophasic response as we got
24 a single appearance on approximately the 14th day. There
25 was no evidence of erythema or other skin damage. This

1 differs from previous reports in the literature, but may
2 be at variance. This may be explicable on the basis that
3 these people did have dark skins, and the darkness of the
4 skin obscured the early response.

5 With regard to the severity of the lesions in terms
6 of incapacity to the individuals, the lesions in some of
7 these individuals were painful and of sufficient severity
8 that under all ordinary circumstances, these individuals
9 would be admitted probably to the sick list.

10 It was the clinical impression in general that
11 these lesions were quite superficial in nature. We are
12 unable to determine whether the explanation for this is on
13 the basis of the total dose received or whether it may be
14 due to the energy of radiation, that is, with lower energy
15 betas one might expect more superficial lesions.

16 In general the severity of the lesions observed
17 correlated well with the amount of fallout presumably
18 encountered by the individuals. That is the Rongelap people
19 had the most severe lesions, the Ilinkila with less fallout
20 and less total dose had the same type of lesions, but less
21 severe, and generally later in appearance, and healed more
22 rapidly.

DOE ARCHIVES

23 With regard to the loss of hair, again this
24 apparently occurred in areas where material was actually
25 deposited on the scalp. It was spotty in nature, and

1 presumably was not the result of a field of gamma radiation.
2 As I say, it was associated with actual material deposited
3 at the site. It is difficult to arrive at a dose biologically,
4 that might have caused this. However, the figure has been set
5 at the upper limit occurs and recovery is possible, is
6 approximately 700 r since the hair did grow in on the
7 individuals later. We can presume that the upper limit
8 might have been of the order of 700 r.

9 I think it is worthy of note to state that in
10 general the lesions required no special treatment of any
11 kind. No so-called specifics were used. Healing in
12 essentially all cases was entirely satisfactory. Also, even
13 in the most severe cases of skin damage, there was no systemic
14 manifestations that could be attributed to the skin damage.

15 With regard to the prognosis of the skin lesions,
16 here again it is essentially almost anybody's guess. There
17 are a number of opinions on this. I think it is fair to
18 say that clinically with fairly large doses of radiation
19 that recovery has been apparently complete, and that we can
20 be optimistic probably about the ultimate fate of these
21 skin lesions. However, because of data in the literature
22 indicating later breakdown in these lesions, and carcinogenic
23 changes, it is necessary that we retain a guarded prognosis
24 and an attitude of watchful waiting.

25 With regard to the skin lesions, I would like to

1 mention the nail pigmentation. I think most of you are
2 familiar with that. That appeared at the base of the nail,
3 a bluish discoloration. Apparently this was an aberration
4 of pigmentation. I think it has been reported only once
5 in literature in a single individual.

6 With regard to the hematological findings in these
7 individuals, here we see no justification throughout in
8 treating the individuals other than as roots exposed to the
9 same dose of radiation. There is no physical basis upon
10 which to segregate them. Even in the case of the Army boys,
11 it appears that their activities are not too different from
12 the remainder of the Air Force boys, so these were treated
13 as a group as with the other exposure groups on the various
14 islands.

15 A word as to the controls that were used for the
16 hematological studies. They are, I think, at least as good
17 and probably considerably better than most clinical studies
18 of this nature. That is, the control groups were matched
19 with respect to age and sex to the actual exposure groups.
20 So that while we must recognize that strict comparisons are
21 not valid, as we cannot state definitely that they are
22 homogeneous samples of the same population, still we feel
23 it is an excellent control group, and will serve very
24 adequately as a guide. DOE ARCHIVES

25 For the control for the native groups, we went to

1 Majuro and obtained a very large control group, as I say,
2 comparable in age and sex to the exposure group. For the
3 Americans we obtained a group of Americans that had been in
4 the mid-Pacific for a period of at least two months, and at
5 least to that extent were comparable to the Rongerik Americans
6 who were out there approximately two months when exposed.

7 The control populations -- the controls for the
8 Natives were broken down as regards to age and sex. They did
9 show a difference in response as a function of age. In
10 general as far as the leukocyte-lymphocyte count is concerned,
11 the children below five were different than those above five.
12 With respect to platelets, individuals below 15 were
13 significantly different than those above 15. So they have
14 been broken down into these age groups, and I will speak only
15 of the adults unless I specify children.

16 In the large exposure group in the Rongelap, there
17 is no question as to the definite change in the hematologic
18 picture. They did fall and remained at a fairly low level
19 for a period of weeks, and there are indications that they were
20 returning towards normal when the group studies were
21 completed.

DOE ARCHIVES

22 The change in total white count was reflected in
23 both the leukocyte counts and lymphocyte counts. The
24 lymphocyte counts fell immediately to a level of 2,000 cells
25 and remained throughout the duration of study, and no evidence

1 of return to normal when the study was completed. The
2 neutrophils fell initially. They fluctuated considerably.
3 Apparently they were returning to normal toward the end of
4 the study.

5 The platelet counts in the Rongelap group showed
6 a very definite decrease. I do not have slides of this, but
7 I think it is quite evident from the graph, and you can see
8 the general trend. Certainly there is a marked fall from
9 the normal values. They reached a low on approximately the
10 28th day, and returned to a value of roughly half way between
11 that low and normal, and perhaps were returning to normal
12 at the completion of the study.

13 I might say in passing that in general the platelet
14 count at least showed a more regular response than did the
15 leukocyte count. The curve is very smooth. It shows a
16 definite low and return to normal, while the white count was
17 prone to fluctuate as a function of time.

18 The hematologic findings in the Ilingula group
19 paralleled almost exactly those in the Rongelap group.
20 However, the severity of the changes was not so severe. The
21 time trends, however, were the same. DOE ARCHIVES

22 With regard to the Americans, looking at the white
23 count, the lymphocyte count or the neutrophil count, one
24 would be very hard put to say that they had been exposed to
25 radiation. The counts are lower than normal, but here again

1 we get into the control business, and it is difficult to
2 evaluate the extent of fall. However, if we look at the plate-
3 let count in that group, here again we get what appears to be
4 a very definite fall with a low reached at the same time as in
5 the exposed native population, and a return towards normal
6 towards the completion of the study.

7 A word with regard to children versus adults.
8 In the Rongelap people, I think with all end points -- all
9 hematological end points, -- the children seemed to show a
10 more marked response than did the adults. That is on the
11 basis of absolute count. That is, we take the counts
12 per cubic millimeter, and the children's counts were lower
13 than adults. However, if we take these on the basis of
14 per cent of control, this makes a considerable difference,
15 particularly in terms of the lymphocyte count. If we take
16 it in terms of per cent of control, the children were markedly
17 more affected than the adults, which in terms of absolute
18 counts they were more affected, but not nearly to the same
19 degree.

DOE ARCHIVES

20 With respect to the time trends in hematology in
21 general, they were markedly different than is observed in
22 the laboratory with large animals. The fall to the lowest
23 point for both the myeloid elements and the platelets was later
24 than seemed with animals, and its return towards normal was
25 later than has seemed with animals.

1 90. While using their figures for biological half life of
2 this period of 81 days extrapolating back to 30, we come out
3 with a body burden of 1.4 microcuries at 30 days.

4 Barium comes out .7, Lanthanum is .7. The
5 remainder of the activity, the rare earth group, comes out .4.
6 Strontium, barium, and the rare earth group together
7 constitute about 75 per cent of the total beta activity.

8 We found no evidence of calcium 45.

9 If you want to extrapolate this back to one day --
10 and this is a very difficult thing to do -- we decided the
11 best way to do this would be to use the human radium data.
12 Strontium is known to fall off at the same slope at a lower
13 level. We have not calculated it for one day, but it will
14 give a value quite a bit higher.

15 MR. HARRIS: No, I don't think so. I think if ~~to~~
16 30 day level of strontium, taking in per cent of the total
17 amount in the body of the dose given, it may come up about
18 the same as the number which we took back to one day.

19 MR. COHN: We will have to check this further.

20 MR. HARRIS: This can be checked. As I recollect,
21 this puts us in much better agreement than we were before.

22 MR. COHN: The half life of strontium in the first
23 three days is quite tremendous. It has a biological half
24 life of about 4 days. You have to be careful in extrapolating
25 back. Since we have no sample earlier than 16 days, we have

1 to be quite cautious.

2 One other point. You mentioned that since this
3 is pretty close to tolerance that we don't think it is too
4 important. I think we have to be very careful. While we
5 may be close to tolerance or a little over, we have a complex
6 situation in which we have not only the internal dose of all
7 these separate emitters added up to close to tolerance, but
8 which have what we think was close to a tolerance external
9 dose. I think the effects are more than just additive.
10 Certainly it does not affect the acute situation. We did
11 individual studies on individuals separately for many days.
12 We tried to correlate our excretion in the urine with various
13 levels of blood picture curves, the platelets, and white
14 cells, and we could not find any correlation. In general,
15 and I think we all agree on this, the internal body burden is
16 roughly proportional to the external dose that was calculated
17 for each group.

18 The Rongelap are the highest. The Iligina have
19 received half the external, and they are pretty close.
20 Their mean excretion is pretty close to a half of the Rongelap.
21 The American group -- I am not sure what the external dose is
22 now -- the internal dose is pretty close to a fourth of the
23 Rongelap. I think we agree on that now. DOE ARCHIVES

24 MR. HARRIS: This shows a little less than a third
25 and assuming all errors I would assign a sigma of about two to

1 this one over here, and a sigma of 6 to that one over there.

2 MR. COHN: I even go further. The individual
3 variations within each group are great. Some show
4 practically none, and some show 3,000 count per 24 hours.
5 Most of this activity is due to adjusting. This is especially
6 borne out in the animal data in which we find the highest
7 amount of activity. GI system and liver and very little
8 activity in the lungs. As pinpointed out, it is not too
9 likely that due to the large size of the particle, 6 to 200
10 microns, that a great deal of inhalation would have occurred.

11 DR. BUGHER: It is very clear that these quite
12 different approaches have given results that are not too
13 different, and the results are remarkably close.

14 MR. HARRIS: One other thing that I did not put
15 on the slip of paper is that so far in our findings in the
16 Japanes we have had some trouble with the strontium method
17 on those. But the activities found in beta activity at
18 these late times indicate that the Japanese were very
19 similar to the Rongelap natives in the amount of internal
20 exposure, and a similar number might be postulated as the
21 native number for exposure to numbers of fish. DOE ARCHIVES

22 DR. BUGHER: As I recall, you put a lot of
23 emphasis on the plutonium excretion measurements, did you
24 not, using that as one of the approaches to the body burden
25 story from the excretion rate of plutonium in the urine?

1 MR. HARRIS: The values were so low that although
2 we have better human information on excretion at various
3 times, the amounts we found in the urine were so low that
4 there is no significance attached to these numbers. We
5 tried it with small volumes of urine and large volumes of
6 urine, trying to go as high as three liters of a pool sample
7 but this does not work because the residual that you get
8 and the troubles you have with self absorption in counting
9 these, using the larger volume, negates your result.

10 Especially in this highly concentrated urine --
11 this is very interesting as a sidelight -- in the standard
12 procedure at Los Alamos in these urines that they use daily on
13 all personnel, at the end of the system there is practical
14 ignition of the residue takes place, and a great flame shoots
15 out and pieces of glass break up and fall in.

16 On the natives this was really something to see
17 because of the concentration they had. This plutonium
18 number you cannot depend on. If we take what is known about
19 the amount of plutonium made in this particular device, the
20 uncertainty is still too great to use plutonium to come out
21 with the number of fissions.

DOE ARCHIVES

22 DR. BUGHER: I take it you did not ascribe those
23 pyrotechnical displays to radioactivity. The Japanese did.

24 MR. COHN: There were a couple of other interesting
25 items that I might bring up. One concerns the internal

1 than that. We will probably need your raw data.

2 MR. HARRIS: We can talk about this later. There
3 is no use taking up time here.

4 DR. BUGHER: Now we will turn to the long term
5 medical care and study problem. I see I am listed for that.
6 I will tell you what we have done.

7 **OUTLINE OF EXISTING PLANS FOR LONG TERM**

8 **MEDICAL CARE AND STUDY.**

9 The situation which arises, of course, is unique
10 inasmuch as this gets into fields of responsibility and
11 authority where the lines are not automatically sharp and
12 clear, and where we have the problem of groups with authority
13 without capability; other groups with capability and without
14 authority, a situation which involves us inevitably with
15 other countries to some extent.

16 Then you have the immediate problem of following
17 a relatively small group of people who are not familiar
18 with and do not understand any of these things that I have
19 mentioned previously.

20 To meet all of these things we have by fairly
21 general agreement made certain arbitrary decisions in the hope
22 that they are based on logic, but they have certain degrees
23 of arbitrariness, as you realize.

DOE ARCHIVES

24 In the first place, these people are not United
25 States citizens. The territory on which they reside is not

1 American territory. The United States under the United
2 Nations Trusteeship Agreement is the governing authority. It
3 does not have sovereignty. That is one aspect.

4 The governing authority has an administrative
5 organization under this trusteeship agreement. That
6 administrative organization has its home base as far as
7 Washington is concerned in the Department of Interior after
8 the transition from Navy to Interior for that function.
9 The central office of the administrator of the trust
10 territories is presently at Honolulu, and will probably be
11 moved either to Guam or Truk within a few months, the idea
12 being to make it more central. But at least that is the
13 administrative centers.

14 They have various district centers and administrators
15 and that is the administrative framework which exists. It
16 has seemed to us that any departure from that administrative
17 pattern would run at once into the questions of legality and
18 even more importantly from the practical standpoint it would
19 lead to confusion. Therefore, it seemed very important that
20 the Marshal Islanders themselves, as they look at things,
21 would see only one agency. That is the one they always deal
22 with, namely, the Office of the High Commissioner for the
23 Trust Territories. DOE ARCHIVES

24 There we have the example of authority without the
25 capability. The High Commissioner does not have the scientific

1 staff, he does not have the logistic resources which would
2 enable that organization to do any of the things that must
3 be done here.

4 In the area of medical responsibility, the Atomic
5 Energy Commission has accepted the responsibility for
6 continuing studies indefinitely in the same way that we have
7 the responsibility for the studies in Japan. The Commission
8 has resources scientifically of varying character, but not
9 all of them, and does not have in itself the necessary logistic
10 support in the Pacific Area.

11 So here again agreement first with CincPac that the
12 Navy would undertake to support as necessary the question
13 of transport, supplies and so on; in so far as possible
14 certain of those activities have been charged to, and the
15 costs recovered from, Joint Task Force 7. But this organiza-
16 tion, of course, is one that terminates after a time and is
17 succeeded by another one. So that it is clearly recognized
18 that the task force could only be economically responsible
19 for a short period of time, and later on the question of cost
20 might have to be resolved in some other way in regard to
21 logistics. However, that is something that is more of a
22 minor problem. DOE ARCHIVES

23 We should also recognize that when it comes to a
24 question of performance, the capability rests in various
25 places. It has been our thought that as far as is possible,

1 the same group of people who have done the basic study should
2 continue with interval surveys and detailed studies of these
3 people over the succeeding years.

4 We realize that faces will change. Some of you will
5 go to other posts, and some may go to other appointments
6 entirely. But as far as possible we would like to see a
7 continuity of interests here, and participation.

8 The routine, I might say, normal medical care of
9 these people will be assumed by the trust territory. For
10 example, the people at Majuro and the Rongelap people will
11 be looked at and watched over as far as their daily ills are
12 concerned by the medical people there, and would have the
13 services of a hospital. When they go back to their home atoll,
14 it may be necessary to set up some sort of a special station
15 there which would make it possible to carry on a dispensary
16 service on a considerably more elaborate basis than they had
17 before, which was nearly nothing, and also to furnish a base
18 of operations for the teams that would presumably go out
19 at intervals, the intervals perhaps getting a little
20 longer as time goes on.

DOE ARCHIVES

21 This latter type of thing could also be carried
22 on through the trust territory administration. Our job is to
23 see that it is done, and that the facilities are provided.
24 Where the High Commissioner gets his facilities is
25 something between him and the rest of us, actually. But as

1 far as the people are concerned that is an activity of
2 the Commissioner. I think there will be no difficulty
3 about any of those things.

4 The project itself has been one of joint participa-
5 tion. The Navy, of course, has contributed very heavily
6 here in the matter of personnel and time and thought, and
7 it is simply a simple testimony to the fact that the people
8 who have been interested and working in these fields have
9 predominantly been in the two Naval Research Institutions.

10 Those are some of the factors in the pattern of
11 responsibility and organization. Our objective is to maintain
12 a smoothly working situation so that the continuing medical
13 studies can go on indefinitely, I think.

14 The discussions yesterday on prognosis emphasized
15 especially the long term end results which can only be
16 appreciated by following these people over many years.

17 In a letter to Admiral Pugh, which has come to
18 the various persons concerned, I outlined the background of
19 the problem, the way it was handled, the results to date,
20 and itemized the objectives of continuing investigation as
21 I think we all pretty much agree at the present time should
22 be kept in mind. These are as listed here. DOE ARCHIVES

23 I am talking now of these interval examinations.
24 A complete physical examination and interval history.
25 Second, hematological studies, including quantitative

1 examinations, such as hematocrite, white blood cell count,
2 differential count, platelet enumeration and bone marrow
3 studies.

4 Three, special investigation employing both color
5 and black and white photograph, as well as skin biopsy if
6 the latter are indicated.

7 Four, ophthalmological studies with special reference
8 to the lens. This will obviously come in with a little time
9 to fit in with the studies in Japan.

10 Five, special growth studies of children, including
11 attention to the development of dentition. I believe that
12 was mentioned yesterday.

13 Six, the progress of pregnancies, and the status
14 of newborn infants. I don't think much comment is required
15 there except that essentially it be a documentation of
16 nothing happening in all likelihood.

17 Seven, quantitative studies of internally
18 deposited radioisotopes by means of urinary excretion measure-
19 ments, external radiological measurement and localization,
20 together with such radiography as may be useful. That is a
21 euphemistic way of saying if people die, we want full
22 autopsies.

DOE ARCHIVES

23 Eight, environmental surveys of the affected islands
24 and atolls and appropriate examination of the animals left on
25 the contaminated islands. In other words, the project needs

1 There will undoubtedly be problems arising that will have to
2 be resolved from time to time. The main thing is that
3 we keep a project going in continuity more or less
4 independently of the individual task forces that come and go.
5 Of course, it would be somewhat associated with each and
6 every one. Those are the general thoughts, Captain Kellum, I had
7 on that part of it. I would like to have your comments, and
8 Captain Yarbrough's, on the general project.

9 CAPTAIN KELLUM: I think I am not in a position to
10 speak for the Bureau, but from our own point of view, we are,
11 of course, very much appreciative of the opportunity of
12 participation and look forward to continuing our participation
13 and support.

14 I can't miss this opportunity to comment briefly
15 on the general spirit of good will which has prevailed
16 through all of these successive operations, and which has
17 made possible the smooth cooperation of representatives from
18 many different agencies with what appear to be first rate
19 results.

DOE ARCHIVES

20 DR. BUGHER: Thank you. Captain Yarbrough.

21 CAPT. YARBROUGH: I would like to echo Capt. Kellum's
22 comments on the affability of the relationships in this
23 particular endeavor. In fact, I would like to go a little
24 further and say that I think that it presents an opportunity
25 for our naval participants perhaps to solve some of our
problems.

1 doing it. I might elaborate a little bit. They are
2 radiochemists primarily. However, in conducting the survey
3 they would want very much to have the cooperation of such
4 people as Donaldson, perhaps individuals in the trust
5 territories, and individuals who have worked with the uptake
6 of radioactive materials in plans, to assure that proper
7 sampling is conducted, and that they do get the proper
8 vegetation, and so forth, so that their results are meaningful.

9 As I say, this group would be interested in taking
10 the responsibility for seeing that the resurvey is properly
11 accomplished.

12 DR. DUNNING: Dr. Dunham, it seems to me that the
13 sensible way to go about this is to find out what plans are
14 in the making. I am sure I don't know all the plans of the
15 Donaldson group and NRDL, and the carryover from Task Force 7.
16 We should find out what is in the wind. Again I am not sure
17 as to where we stand, shall I say, legally. But it would
18 appear to me again that we need a central agency for someone
19 to get this thing coordinated. It is just that. It is not
20 the idea of giving commands, but of coordinating the efforts
21 just the same as this whole medical team going out. Perhaps
22 we need another similar program on the physical side of it. DOE ARCHIVES

23 DR. DUNHAM: Dr. Bugher, we are currently discussing
24 the matter of resurveys of the natives and islands. Dr. Bond
25 has made the suggestion that the two not be considered as

1 identical efforts necessarily, because the natives are down
2 at Majuro, and have an entirely different logistic setup
3 as opposed to returning to the islands.

4 The discussion has gone so far as to Dr. Bond
5 offering and urging that the NRDL group be permitted to be
6 the group to resurvey the islands, perhaps in September
7 and again in March, with a thorough survey of the plants,
8 soils and food supplies.

9 The question immediately comes up, what other plans
10 are in the making or actually under way for resurveys of
11 those islands from a radiological safety standpoint, and the
12 standpoint of the food chain possibly being contaminated.

13 Is Donaldson's group going to do anything there
14 that would overlap or duplicate such a proposal?

15 DR. BUGHER: Yes. The existing things, I think,
16 are these. The marine biological side of it is immediately
17 in Donaldson's hands. In that capacity he reports to this
18 Division. However, his work does tie in with some other
19 aspects of the Pacific Science Board and fans out in various
20 ways, even including the University of Hawaii.

21 The main responsibility there for the marine
22 biological situation is in Donaldson's hands, particularly
23 with reference to the fish. DOE ARCHIVES

24 We have also on Eniwetok the small biological
25 station which we have set up which is available not only

1 to government organizations, but to university marine
2 biologists who may want to spend time studying some aspects
3 of the coral atoll. Some of these studies, at least, should
4 bear on the environmental thing.

5 We have in the Division a large program which is
6 purely environmental contamination studies which we carry
7 under the name of Gabriel. The scope of that program is
8 worldwide. The problem of the biological setup of the
9 contaminated islands is clearly likewise germane to that
10 program. That brings us into close cooperation with the
11 Department of Agriculture, because some of the outstanding
12 skills in soil composition, soil analysis, and so on, lie
13 there. We have an extensive cooperating program there.

14 We also have a very elaborate setup for analysis
15 for longer lived isotopes. It is set up in three places, the
16 New York Health and Safety Laboratory, the Columbia University
17 project, and one in Chicago. So that the environmental
18 aspects here are quite broad. Any group that does the inter-
19 mittent surveys will have to plan that it will be not
20 only working for itself, for its own interests, but also
21 a service group for various other outfits who likewise have
22 very pertinent interests here, and have available skills and
23 resources which perhaps would not be entirely available to
24 any one particular group. DOE ARCHIVES

25 You all had that problem confronting you with

1 Quadjalein's operation when Cdr. Cronkite began to feel
2 that he was the chief dispenser of urine for the whole Pacific
3 area and even suggested a different code name for the
4 operation, the name of one of the more popular and decorative
5 woods in the Marshall Islands, which I thought was a very
6 nice name. The species known as the *Pissonia Jiant*. However,
7 we work it for the actual handling for the immediate
8 environmental survey, that group is going to have to do a
9 lot of specimen collecting for other people who are interested.

10 Our general feeling is that whatever group has a
11 legitimate interest and capability we should get the material
12 for them and expect from them a report of results to go
13 into the hopper here. That is the way it has been working.

14 DR. DUNHAM: I might interject one remark here
15 that just occurred to me, Dr. Bugher. Are we to consider
16 indefinitely that these surveys have to go through the task
17 force report channels, or is there a cutoff point when they
18 become sort of on their own?

19 DR. BUGHER: The cutoff point is when Task Force 7
20 is no longer active. What is that situation, Colonel?

21 COL. BROWNING: As far as I know, Task Force 7
22 will go out of existence some time this summer. It should be
23 some time during July, as the last guess on that.

24 DR. DUNNING: The last I knew, Admiral Bunson was
25 taking over at the end of July.

1 DR. BUGHER: The real problem that the authority
2 outside Eniwetok and Bikini lies in the trust territories
3 administration. He is the one that in a sense puts on us
4 the requirements to satisfy his needs. So we all in a certain
5 sense become a service facility to him.

6 In practice actually he recognizes that the capabil-
7 ity for planning and all that lies in this general group of
8 agencies and people. If he finds that he can't answer all
9 the questions that are asked him, he may ask us to do some
10 things that we may not have thought of. But generally
11 speaking, that is our line of authority and our general
12 responsibility.

13 The point you raise is a good one, especially the
14 situation while the people of Rongelap are down on Majuro
15 Atoll, and it may therefore be practical and convenient to
16 submit the thing, particularly during this period. Is
17 that what you had in mind?

18 DR. DUNHAM: That is what Dr. Bond was suggesting.

19 DR. DUNNING: Let me ask Dr. Bond in the light of
20 what Dr. Bugher has just said, would you still give the
21 same expression of interest and willingness? DOE ARCHIVES

22 DR. BOND: I believe so. Of course, they are
23 interested in obtaining the samples and doing radiochemical
24 analyses on them, and following the uptake material into the
25 edible plants. They are willing to do this obviously on

1 samples that someone else collects or they are willing to go
2 out and collect the samples, and have stated they would be
3 quite willing to collect additional samples for other
4 interested agencies.

5 DR. DUNNING: I am wondering then if one possibility
6 might be that NRDL actually do the shovel work and someone act
7 as coordinating agency to see what the needs of the other
8 people might be?

9 DR. BOND: This may be. Who would that be likely
10 to be?

11 CAPT. YARBROUGH: I think NRDL has gone a little
12 further than Dr. Bond is indicating, in that this morning
13 we have a proposal formulated, and there are quite a
14 few specific items in it, where they wish to have it in the
15 form of a project. Inasmuch as I will have to give an
16 answer one way or another to this proposal, it would be
17 very interesting to get the consensus of opinion here.

18 They are proposing that it be done at the same
19 time as the biomedical portion. They propose that USNRDL
20 carry out these studies in fiscal 1955 at the 2.6 investiga-
21 tion or man year level. The estimated cost of this will be
22 some astronomical figure of \$42,000. Since it is envisioned
23 the program outlined may continue over a period of several
24 years, it is suggested that while the laboratory will
25 probably be supported by BuMed and/or BuShips, it may be

1 DR. BUGHER: You may get an answer there on trying
2 to distinguish between background and the individual counts.
3 Some of the Air Weather Service people who were on Rongerik
4 would be fine. In other words, they have much lower levels
5 so if one could recognize anything on them, then you would
6 know it would pay off to haul the equipment out.

7 MR. HARRIS: It had been calculated. I think as
8 far as the Air Weather Service personnel, it was calculated
9 on the basis of urinary excretion. You might be able to
10 see this beyond the natural K-40 background. This would be
11 entirely in the nature of an experiment if it was done,
12 and not come into routine medical situations as far as I can
13 see.

14 MR. HARLEY: Where could you make the measurements
15 that the background from the fallout would not be too much
16 for you ?

17 CDR. CONARD: I don't think Majuro got any fallout.

18 MR. HARRIS: Our background at Los Alamos is higher
19 than it is at Quadjalein.

20 MR. HARLEY: Majuro got a pretty good sock.

21 MR. HARRIS: You could not carry any such thing
22 farther than Quadjalein. This is designed to take care of
23 high backgrounds. Ten tons, it has to be. DOE ARCHIVES

24 DR. BUGHER: The question of autopsy is again
25 going to be something which will have to be arranged with the

1 local medical personnel. I do not know how difficult it is
2 to get autopsies of the Marshallese.

3 CDR. CRONKITE: They have done autopsies at
4 Majuro. They have to be done immediately. Their custom is
5 to bury people within six hours after death.

6 DR. BUGHER: So almost certainly you are going to
7 have to reach an understanding with the medical officer to do
8 an autopsy and collect the material you wish, and preserve it
9 in the manner which you desire to have it preserved for ship-
10 ment to you. The chances of special teams ever having an
11 opportunity to do an autopsy are not too good.

12 CDR. CRONKITE: These were made originally by
13 the commander, and after the decision to move to Majuro was
14 made. It is not clear to me whether anybody talked to Dr.
15 Kirk at Majuro, whether they are aware of the necessity for
16 doing autopsies.

17 DR. BUGHER: I think they are vaguely aware of it,
18 but as far as specific needs are concerned, I am sure
19 that has not been communicated. That is one of the things
20 that could be done. I think they are willing to do anything
21 that is asked of them, if they are able to do it, and will
22 follow the suggestions quite enthusiastically. I don't know
23 of any specific request having been passed to them, other
24 than that they should give the general medical care to people
25 that under the other plan would have been forthcoming from

1 the medical officer at Quadjalein. I am sure they will do
2 these other things, too, if you will just outline to them what
3 is desired.

4 CDR. CRONKITE: Would that be done by the first team
5 that goes out there, or should this be carried down through
6 the trust territory, so that everybody is aware of the need?

7 DR. BUGHER: I think it probably might be a good
8 thing to prepare that in a set of written instructions of
9 things that are needed, and we transmit that through the
10 trust territory administrator so that in case somebody should
11 die, before the team gets out there, that the opportunity to
12 get material would not have been lost.

13 Are there other comments along the lines of these
14 topics?

15 CDR. CONARD: In addition to that, I think that
16 it would be nice to have good rapport there on the
17 observation of skin and any other changes.

18 DR. BUGHER: Yes, I think we assume all through
19 here that everything that is done is done by the cooperation
20 with the trust territory people, just as the movement of
21 the people, for example, has been done as far as form is
22 concerned, under the general supervision of the trust
23 territory officer. He is the one that the people themselves
24 look to, not only during times of special studies, but in the
25 interim. In that sense, we are simply backing up their

1 people in carrying out these various things. So I think you
2 will find to whatever extent is useful trust territory
3 administrative people are available at all times.

4 Are there any other comments or questions here?
5 If not, we have a subsidiary topic called institutional and
6 individual responsibilities. Have we covered that sufficiently
7 or do you wish more comment on that?

8 CDR. CRONKITE: There was a statement earlier when
9 you were out, Dr. Bugher, of the desire of the Army and Air
10 Force to have people participate in this followup. If these
11 people could be designated so that they could be split up
12 between the team that Dr. Bond takes and the one that I take,
13 it would be most helpful in our planning.

14 DR. BUGHER: Yes.

15 CDR. CRONKITE: I would like to also extent it
16 not only to the matter of officers, but to enlisted technical
17 personnel, so that no one laboratory gets hit too badly at
18 any one time.

19 DR. BUGHER: I think Col. Browning would undoubtedly
20 keep various groups in the picture. For example, Col. Brennan
21 and other groups interested in these lines. There are
22 various others, some of whom have been scattered a bit, but I
23 think could be recovered on special assignment on things of
24 this sort. So that in a way what we get concerned with are
25 individuals who may have special competence and interest

1 here, and that involves any institution with which they may
2 be associated with at the time. Fundamentally it is the same
3 old problem of people who are competent and interested,
4 wherever they may be, if they could be made available.

5 The question on Uterik. The environmental studies
6 will have to be done at all three atolls. These teams
7 naturally should pay some attention to the Uterik people, but
8 I presume the proportion of attention will be pretty much
9 along the line of proportion that they got in the beginning
10 which was not very much. In other words, just an overall
11 surveillance to make sure nothing odd is developing.

12 DR. DUNHAM: Should they be reviewed this year at all,
13 that is, the Uterik people?

14 CDR. CRONKITE: Practically speaking, I think not.
15 From an academic standpoint, probably yes. My general
16 thinking along these lines was that since they had perhaps a
17 teth of the exposure that the Rongelap people did, if nothing
18 is showing up in the Rongelap people, there is relatively
19 little reason for even academic purposes to study the Uterik
20 people. If something does occur in the Rongelaps, then we
21 should take a look for both straight medical care and academic
22 reasons at the Uterik people. DOE ARCHIVES

23 DR. BUGHER: They obviously should be visited by
24 the special team at least as a social call, if nothing else.

25 DR. DUNNING: What do you wear on an occasion like

1 that?

2 CDR. CRONKITE: Mr. Eisenbud expressed an interest
3 before I left Quadjalein in having urine samples from the
4 Uterik people. When I do not know, or what intervals he
5 desires.

6 MR. HARLEY: Are they back now?

7 DR. BUGHER: They are back on their own atoll at
8 the present time.

9 MR. HARLEY: We would like to get a set of samples
10 before this project gets going, if we can. We were thinking
11 of dealing through the trust territory people perhaps to get
12 a sample certainly in August, and then perhaps another
13 sample when you get out there on the study, if that is
14 possible. I think the urine sampling can be done without any
15 of our personnel there.

16 DR. BUGHER: They are accustomed to it now.

17 MR. HARLEY: Yes.

18 DR. BUGHER: At least the Rongelap people are. So
19 I think that is probably the balance of the thing.

20 Administrative and logistic support we have already
21 discussed. Those are administrative problems which we have
22 to solve among the group here, really. I think that has been
23 already pretty well clarified. DOE ARCHIVES

24 Now, the transportation, air and surface. Air is
25 MATS, I presume, and surface transportation again comes to

1 Commander, Naval Station, Quadjalein, I believe, for
2 probably all of it, unless this 10 or 11 ton piece of
3 equipment, and things of that sort, have to go out. That would
4 be a surface transportation problem.

5 MR. HARRIS: I was wondering if you had at all
6 considered the possibility of getting some of your logistic
7 support from the Eniwetok field office, and their prime
8 contractor.

9 DR. BUGHER: Yes, we have. We may very well wind
10 up with a launch over at Rongelap for environmental surveys
11 and continuing studies of various kinds. But at the present
12 moment, we have not approached the field office with any such
13 request. I think in a way we have to wait until the need is
14 a little more clear than it is now before we make a specific
15 request.

16 MR. HARRIS: I was particularly thinking from the
17 point of view of the people who are doing the environmental
18 studies if they could take an LCU or something of that sort
19 from Eniwetok to Rongelap, and work off it. They could
20 perhaps cut down their time of stay from maybe a month down
21 to a week or something of this sort. DOE ARCHIVES

22 DR. BUGHER: Particularly between test series there
23 is not too much difficulty in getting such equipment. The
24 question is housing and messing here. That is something
25 I presume the teams have to solve for themselves.

1 becomes progressively greater.

2 DR. BOND: The point I was thinking of is whether
3 to take more and stay a shorter time, or take less and stay
4 a longer time.

5 DR. BUGHER: My point of view is that the fewer
6 people, the longer time is the more productive sort of thing.

7 DR. BOND: Then we will compromise on it.

8 CAPT. YARBROUGH: What will you settle on, say 12, 13?

9 DR. BOND: We can leave it at 10 or 12, and we
10 can supply in the next few days the specific names. As a
11 matter of fact, we can do it pretty well right now.

12 CAPT. YARBROUGH: I think if you can quote something
13 like not more than 12 people --

14 DR. BOND: I think that is a reasonable figure, not
15 more than 12 people.

16 DR. BUGHER: Is there any other aspect you would
17 like to bring up in that connection?

18 CDR. CONARD: Do you think these arrangements
19 could be completed by around the middle of August or some
20 where thereabouts?

21 DR. BUGHER: I don't see why not. We are going to
22 have a double problem a bit. That is, one for the medical
23 people, another one for the environmental people, and the latter
24 may need either a landing craft for a week or ten days, or
25 it might need that plus a temporary camp. We will see where

1 we come out there.

2 That seems to cover the Item C, integration of
3 visits between Marshallese, trust territory, DOD, AEC, and
4 CincPac. All visits which involve Marshall Islands
5 people and area, that is, the territory outside of Eniwetok
6 and Bikini should be cleared through the High Commissioner
7 of the Trust Territory. It will be up to him then to inform
8 his people as to when and who is coming, and what is expected
9 of his people. He will do that with a great deal of
10 enthusiasm, because he feels very strongly that the work of
11 this group has fundamentally greatly benefited the conduct
12 of the administration of the whole trust territory. It has
13 put the United States Government in a firm position of a
14 humanitarian interest in people, and in their welfare, which
15 is worth more than any amount of words. So we can anticipate
16 no reluctance on the part of the trust territory
17 administration to advance these studies in any way that they
18 possibly can.

19 All visits likewise informed to CincPac. In other
20 words, these plans with the trust territory likewise should
21 be communicated to CincPac. The various other groups here
22 which are concerned, also, that is, AFWAP, in general, is the
23 channel for the information of the services as to what is
24 going on. Entry to Bikini and Eniwetok will be cleared
25 also from here through Santa Fe Operations Office, and the

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1 Eniwetok field station.

2 Is there any other thing that you can think of in
3 regard to routine information of channels?

4 DR. DUNHAM: No.

5 DR. BUGHER: Are there any other comments on those
6 things? What do you think, Col. Browning, in regard to these
7 information channels? Have we missed anything that we should
8 do or have we suggested doing anything we should not do?

9 COL. BROWNING: No, sir, I don't know of anything.
10 I would like you to put in a plug here for a very firm
11 commitment through trust as to the housing and messing
12 because it takes a long time to get extra food out there.
13 If you send 13 people, it is 40 miles a day, and it is not
14 quite that easy for them to provide it. This ought to be
15 well established in advance. If you leave it on the local
16 level, the local officers, whether naval or whatnot,
17 are very hesitant on stepping on the trust toes, and rightly
18 so. They are not in a position to do many of the things that
19 they might do on a stateside base. Anything that can be done
20 in the way of administration earlier will help to get things
21 done in better fashion.

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22 I would suggest in that respect, too, that a rather
23 firm agenda be supplied to the trust so that they will know
24 who will be where under what circumstances, and leave us
25 enough slack in it so that there can be made local adjustments.

1 From a landing on Majuro to the launch landing to this
2 settlement would be five miles. But that is hearsay as far as
8 I am concerned.

4 CDR. CONARD: I don't remember this particular island.

5 DR. BUGHER: This was not inhabited previously.

6 COL. BROWNING: The chances are that they have some
7 sort of water transportation set up at the present time.

8 DR. BUGHER: Yes, they have two launches there, I
9 believe. The trust people seem to have no worry about that
10 transportation link there. When we get back to the Rongelap-
11 Uterik atolls, then they are in trouble, and they really
12 can't move without the Navy moving them.

13 Are there other points that occur to you? Does
14 that seem to be adequately covered?

15 CAPT. KELLUM: Yes, it seems to be well covered.

16 DR. BUGHER: The project officer and reports.
17 Whoever is the project officer is to be responsible for the
18 compilation of the report of that visit. Is that your thinking,
19 Gene?

20 CDR. CRONKITE: The main thing I would like to
21 clarify is what is the report channel? To whom does one report?

22 DR. BUGHER: To the Division of Biology & Medicine.

23 CDR. CRONKITE: It is not a task force report that
24 goes through the WT channel? DOE ARCHIVES

25 DR. BUGHER: The task force has terminated, or will

1 be pretty soon now. So it is a continuing study outside of
2 the original task force responsibility. These reports, however,
3 will go into AFSWAP. They will go to the then existing task
4 force so that all the various people who have and will be
5 concerned with operations there will have this material
6 available to them. But that would be handled in the normal
7 way in which AFSWAP takes care of these things.

8 The report itself would come here. We would
9 arrange duplication at Oak Ridge through the customary
10 procedure. The main job would be to get the report produced.
11 After that, the reproduction is not difficult. For example,
12 when Vic has this next special trip, then the report will
13 come via NRDL into -- what is the channel there? To you?

14 CAPT. YARBROUGH: Via BuMed to BuShips.

15 DR. BUGHER: And then here to us. If it is from
16 MNRI, it will come from your office.

17 CAPT. KELLUM: Yes.

18 DR. BUGHER: Depending on where the team is based.

19 Any service that we can render in helping the thing that
20 is something we will be glad to do, whatever it may be.
21 In that sort of function, we are simply trying to help and
22 not as a matter of authority and command, but naturally expect
23 everybody to give a lift whenever you can. We come to the
24 natural adjournment time for luncheon, I take it. DOE ARCHIVES

25 After luncheon, I think we should discuss a little
more some of the things which we should do in the course of

1 MR. IMIRIE: There is one thing that comes to my
2 mind, Dr. Bugher, and I have talked to Merrill Eisenbud about
3 it, Harley and Dr. Dunning; there has been a question from
4 every survey group that went out as to what readings were at
5 various points. Of course, we all know what happened on
6 these readings. In some cases there were uncalibrated instances
7 and in other cases they were two feet from the ground or three
8 feet from the ground or near the water or under a "hot". It is
9 true that is where the people were. But in addition to that,
10 there was an aerial survey taken which indicated a little
11 higher than most of the ground surveys. The aerial survey
12 would tend to integrate the average dose on the entire island
13 as compared to searching out hot spots and cold spots. If
14 for nothing else, it would give an inter-comparison of
15 one island between another island or one atoll against another
16 atoll on an average integrated basis.

17 Further than that, two readings of aerial survey
18 might prove out or disprove the centimeter which was used.

19 MR. HARLEY: We have data here, for example, on
20 Rongelap taken at 32 hours, one with a T-1-B, and the other
21 with the scintillator or from the air, and the difference
22 between was essentially nothing. It is less than 5 per cent.

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23 DR. DUNNING: Yes, but I was out there, and the
24 first comparisons I made were between the air and the ground
25 and differed by a factor as high as four. I have the raw

1 data here somewhere. Later, Al came up with a new
2 correction factor. That brought the two readings in line.
3 By two readings I mean ground and air. So I think one has
4 to take a pretty close look at the data to see how valid these
5 readings are. Maybe before the operation was over with,
6 maybe he got this correction factor down a little better.

7 MR. HARLEY: There was a little difficulty out
8 there at the beginning. I think it was merely a misunderstanding
9 of Al's. The reason I am pretty sure there was a misunder-
10 standing, even after talking with him, is that he was getting
11 the difference using the centimeter on the ground and the
12 air in the height conversion factors. We spent a lot of time
13 out there after the whole crew was around in re-doing our
14 conversion factors.

15 DR. DUNNING: Understand, I am not taking a strong
16 stand against aerial surveys. They were most valuable and
17 especially in the early times after a shot, when we were
18 pulling our hair wondering what was going on out there. I am
19 not sure, but that it should be done. I am just raising the
20 points that came to us out there, and again say just what
21 purpose are we trying to serve by these additional surveys.

22 MR. HARLEY: My feeling still is that you probably
23 would pick Rongelap Island for your ground surveys and stick
24 to the air for the others, rather than trotting all over
25 under that hot sun. At the same time, of course, you would

1 calibration of the T-1-B has been with cobalt 60. I
2 believe the two instruments calibrated that way, they do
3 agree. When you get into the large component of soft gamma,
4 the centimeter gives a higher reading by a factor of two or
5 so, I thought, early in this fall. It is something that
6 is of that order, anyway.

7 I think that is a subject perhaps we ought to give
8 a little more consideration to, as to whether the airborne
9 survey would pay in view of the fact that we want ground soil
10 samples and plant samples from almost the circumference of
11 these atolls, which means ground survey anyway, as well as
12 sampling. Whether the additional effort which would be
13 required to get a good area survey into operation would pay
14 is the question. I think perhaps we could discuss this
15 somewhat more later.

16 Does anyone have a strong feeling one way or
17 another here? We heard the pros and cons.; I don't believe
18 there really is much more to say. I am just estimating what
19 is the easiest way of getting the necessary data. We do
20 want to document all the islands by one means or another on
21 each atoll.

22 Let us turn to the question of internal hazard.
23 Domestic animals and natural foodstuffs were suggested. On
24 Rongelap I think you could say that the domestic animals
25 that were there are no longer there.

1 CDR. CRONKITE: Rongelap Island, they were not
2 there, but there were quite a few hundred chickens on the
3 northern island.

4 DR. BUGHER: To the very far north.

5 CDR. CRONKITE: Yes.

6 DR. BUGHER: Do you expect to find any surviving
7 chickens?

8 CDR. CRONKITE: They were supposed to be there.
9 Whether they are alive, nobody ever got up there. Which
10 island did you get to?

11 LT. CHAPMAN: Aniola. That is about five miles
12 north of Rongelap.

13 CDR. CRONKITE: You didn't get any there?

14 LT. CHAPMAN: There are no chickens there. They are
15 farther north.

16 DR. BUGHER: The farther north you go, the less
17 likelihood there will be of a surviving chicken. What was
18 the estimated total dose on the far north?

19 DR. DUNNING: The infinity dose was 7,800 roentgens.

20 CDR. CRONKITE: Chickens won't survive 1,000 r.

21 MR. HARRIS: Are there any rats left out there?

22 DR. BOND: I didn't see any at Rongelap.

23 DR. BUGHER: I think you have to assume that all
24 the vertebrate population in the northern islands would be gone
25 or not there any more. Chickens and pigs will be put back on

1 Rongelap when people return. They have been put back on
2 Uterik now. So the domestic animal supply is going to be
3 practically speaking animals introduced after the environment
4 has become acceptable for human habitation. Can you get much
5 out of that or not. That depends on how much low level
6 studies one wishes to do over a period of time. It would
7 certainly appear to be worthwhile to have a certain number
8 of domestic animals with the idea of sacrificing them after
9 a time, or lease accumulating bones after a year or so
10 from the standpoint of their uptake of fission products.

11 DR. BOND: Dr. Bugher, along that line, wouldn't it
12 be as good or better to return material to the most active
13 areas? I am not interested in determining how much the
14 animals pick up from the environment. If we know what we
15 gave them and how much they took up, we would have valuable
16 information.

17 MR. HARRIS: Might it be reasonable to suggest
18 that some domestic animals be put back on the islands on
19 Rongelap itself, when you go out the next time, and those
20 animals could be left during this interim which might
21 possibly give you an idea of what the translocation range is
22 before the natives come back.

23 DR. BOND: That again is for animals, and will
24 be eating different food from the human. DOE ARCHIVES

25 MR. HARRIS: I am not thinking of extrapolating

1 MR. HARRIS: That would change it in that case in
2 orders of magnitude.

3 DR. BUGHER: I think the ratio here is not far
4 from one. The figure we have been using is .9. You
5 mentioned .8 yesterday.

6 DR. DUNNING: I did.

7
8
9
10 DELETED

11
12
13 DR. DUDLEY: I was thinking of the comparative
14 hazard of the quantity of strontium and quantity of plutonium
15 produced. Has it been suggested that the hazard may be
16 comparable?

17 MR. HARLEY: My first calculations were that on
18 an internal deposition basis, they would be about equal.

19 DR. BUGHER: That is something we have to keep in
20 mind, and reconsider from time to time. I think that
21 has been a very helpful discussion. We are coming near the
22 time of compulsory adjournment.

23 If I can very compactly summarize what we have
24 covered, we have reviewed the background and the data
25 obtained from the first study of these people. We have

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1 pretty well agreed that the type of study which was made
2 in the acute phase will need to be continued for an
3 indefinite time, but with a changing emphasis from what
4 might be called acute problems to the long term effects
5 which are particularly likely to manifest themselves in
6 such things as shortening of life, the occurrence of tumors,
7 both superficially and deep, and in bone changes, which may
8 be of a minor nature. I think the expectation is that the
9 long range results of the exposure of these people are not
10 likely to be at all spectacular. One would have to look
11 carefully and use rather critical statistical judgments in
12 all likelihood to be able to say that anything will have
13 occurred strictly due to the radiation. It points to the
14 necessity of conducting continued studies in a very
15 meticulous manner with precise recording of observations
16 and data which will permit the type of statistical considera-
17 tion that may be necessary.

18 We have agreed that the medical studies need not
19 be tightly bound to the environmental studies; that two
20 more or less separate groups can do these two things. I
21 think, though, we all concede that everybody is interested
22 in what everybody else is doing in this study and it doesn't
23 mean that cross information won't be freely flowing. It looks
24 as though the NRDL group probably should be called on for
25 the first medical study of the Rongelap people, and also

1 the first environmental study and specimen collection.

2 The minutes here of this conference will give
3 suggestions as to the types of materials to be collected
4 and precautions with respect to collecting them. I think
5 we will be able to further advise the collecting group about
6 types of material to be sampled and precautions to be
7 exercised in caring for it, and the places in which some of
8 these specimens should go for further analytical study.

9 We may well find that two or even three groups
10 are interested in analyzing for the same thing. Especially
11 in these low level things I don't believe there is any
12 objection to that. If we talk about strontium 90, we may want
13 to send around to each of the participating laboratories a
14 standard ash, which we do have, containing strontium 90.
15 It has been useful in checking strontium 90 analysis in
16 one place as against another.

17 I think as to the organizational matters we have
18 really covered that. This Division will attempt to be
19 a coordinating center and work with the services, with the
20 trust territory administration, and many of the problems
21 we encounter we will have to ask for help from one or the
22 other of the various services that have special facilities.

23 Some points are left somewhat undecided. For
24 example, whether or not to use aerial survey techniques and
25 the extent of ground survey. I think we will need to

1 discuss those a little more extensively.

2 Capt. Yarbrough, can you think of anything which
3 should be added here?

4 CAPT. YARBROUGH: No, sir, at the moment I have
5 nothing to add.

6 DR. BUGHER: We will have plenty of detailed
7 problems and we can solve those as they come up. We hope
8 that the work on the report now goes along expeditiously,
9 and we will all try to do our best in helping the people who
10 have to turn out the report to get their job done. We expect
11 two sections. Section 1 will come a little before Section 2,
12 I presume, being a little less bulky. Do you have any
13 further comment, Gene?

14 CDR. CHONKITE: No. I think it has been most
15 gratifying to get clear in everybody's mind what the
16 administrative machinery is and we shall now try to deluge
17 you through our channels for a lot of things for you to
18 integrate in the very near future.

19 DR. BUGHER: It will be a single integral, I
20 hope, and not a double.

21 We appreciate very much your all giving your time
22 to this program. I hope you realize that our statements of
23 appreciation are really very much understated.

24 As far as the whole conduct of this program is
25 concerned, that is true.

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Incidentally, the Russian resolution yesterday