DEFENSE NUCLEAR AGENCY

WASHINGTON, D.C. 20305

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Enclosed are a Defense Nuclear Agency Fact Sheet and Veterans Administration Circular 10-83-61. The Fact Sheet outlines the plans and progress of the Nuclear Test Personnel Review Program. If you have any questions about the Fact Sheet, please call the toll free number listed in the Fact Sheet. The Circular outlines the VA medical benefits available to the nuclear test participants. If you have any questions about the Circular, please call your local Veterans Administration facility.

Enclosures
as

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CIRCULAR 10-83-61
April 5, 1983

TO: Regional Directors; Directors, VA Medical Center Activities, Domiciliary, Outpatient Clinics, and Regional Offices with Outpatient Clinics

INFO: Directors, Regional Offices; District Counsels

SUBJ: Guidelines for Implementation of Legislation Related to the Provision of Health Services to Veterans Exposed to Ionizing Radiation As a Result of Detonation of Nuclear Devices

1. The "Veterans' Health Care, Training, and Small Business Loan Act of 1981" was signed into law on November 3, 1981. The Act, Public Law 97-72, authorizes the Veterans Administration to provide certain health care services, as described in paragraph 3, to veterans who, while serving on active military duty, were exposed to ionizing radiation from the detonation of nuclear device as a result of participation in either the testing of such a device between 1945 and 1962, or the American occupation of Hiroshima or Nagasaki, Japan, between September 11, 1945, and July 1, 1946. Verification of service at a site during the testing of nuclear devices, or in Hiroshima/Nagasaki during the occupation of Japan, during the times specified will be required. In the absence of affirmative evidence to the contrary, a veteran's contention of exposure at a nuclear device testing site, or in Hiroshima/Nagasaki will be accepted.

2. Health care services may not be provided under this law for the care of conditions which are found to have resulted from a cause other than the specified exposures.

3. Health care services authorized under this provision are limited to hospital and nursing home care in VA facilities and outpatient care in VA facilities on a pre- or post-hospitalization basis or to obviate a need for hospitalization. Such health care services will be provided without regard to the veteran's age, service connected status or the inability of the veteran to defray the expenses of such care. Veterans furnished outpatient care under this authority will be accorded priority ahead of other nonservice-connected veterans and equal to former Prisoners of War who are receiving care for nonservice-connected conditions. Congress made it clear that this law provides for health care only, and that a determination that the veteran is eligible for such care does not constitute a basis for service connection or in any way affect determinations regarding service connection.

4. Each veteran who participated in the testing of a nuclear device or who participated in the occupation of Hiroshima or Nagasaki, Japan, between September 11, 1945, and July 1, 1946, and who requests VA medical care will be provided a physical examination and appropriate diagnostic studies in accordance with DM&S Circular 10-83-12. The examination and studies will be documented in the medical record. If such an examination has been completed within the prior six months, only those procedures which are medically indicated by the current circumstances need be repeated. Where the findings reveal a condition requiring treatment, the responsible staff physician shall make a determination as to whether that condition resulted from a cause other than the veteran's exposure to ionizing radiation.

THIS CIRCULAR EXPIRES ON APRIL 5, 1984

Veterans who meet the criteria of this circular may be treated under this authority. In making this determination, the physician should consider that the following types of conditions are not ordinarily considered to be due to such exposure:

a. Congenital or developmental conditions, e.g., spina bifida; scoliosis.

b. Conditions which are known to have pre-existed military service.

c. Conditions resulting from trauma, e.g., deformity or limitation of motion of an extremity.

d. Conditions having a specific and well established etiology, e.g., tuberculosis; gout.

e. Common conditions having a well recognized clinical course, e.g., inguinal hernia; acute appendicitis.

5. On occasion, the responsible staff physician may find that a veteran requires care for one or more of the conditions listed in paragraph 4, but that the case presents complicating circumstances that make the provision of care under this authority appropriate. In such instances, the physician should seek guidance from the Chief of Staff and the Environmental Physician regarding authorization for treatment. If treatment is so authorized, the reasons will be clearly documented in the medical record. Veterans who are not provided needed medical care under this circular may be furnished care if they are eligible under any other statutory authority.

6. In the event the responsible staff physician finds that a veteran has a condition not ordinarily considered to be due to the specified exposure and there are not complicating circumstances warranting the provision of care under this authority, the decision and its basis will be clearly documented in the medical record.

7. The provisions of this circular will not exclude any veteran who alleges exposure to ionizing radiation as described in paragraph 1 of this circular from being included in a VA Radiation Exposure Registry Program, under development.

8. These guidelines will be effective upon receipt. A copy of the pertinent guidelines should be made available to any veteran seeking care under this authority.

9. This circular rescinds DM&S Circular 10-82-246 dated December 21, 1982.

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Fact Sheet

dna

Defense Nuclear Agency
Public Affairs Office
Washington, D.C. 20305

10 January 1983

Subject: Nuclear Test Personnel Review (NTPR)

Background of NTPR Program.

Between 1945 and 1962, the Atomic Energy Commission (AEC) carried out some 235 atmospheric nuclear tests, principally in Nevada and the Pacific Ocean. An estimated 220,000 Department of Defense (DoD) personnel, military and civilian, were involved in this testing and many received low-level ionizing radiation exposures in the performance of various activities. Because the exposures generally were well within established radiation exposure limits, there was no reason to expect any increased health risk.

The first indication that former test participants might be experiencing adverse health effects possibly related to radiation exposure at the tests occurred in 1977. The Centers for Disease Control (CDC), as a result of its investigation of a leukemia case involving an individual who had participated in Shot SMOKY at the Nevada Test Site in 1957, became interested in the health status of all personnel who had been present at that shot. By late 1977, a DoD ad hoc committee, working together with CDC, had reconstructed a list of approximately 3,200 DoD personnel who were at or near the Nevada Test Site on the day of the SMOKY test and determined that some eight leukemia cases had occurred among them. CDC calculations indicated the expected incidence of leukemia would be three to four cases. CDC undertook an epidemiological study of these personnel and subsequently identified an additional leukemia case. It should be noted that the cause of the leukemias has not been determined to be related to radiation received at the test. In addition, no increased mortality from other forms of cancer has been observed in this group and the total number of deaths from all causes is essentially what would be normally expected.

Responding to this initial indication of a possible health problem, DoD, in December 1977, began a program of wide-ranging actions on behalf of the atmospheric nuclear test participants. The Defense Nuclear Agency (DNA) was appointed DoD's Executive Agent for this effort. The Nuclear Test Personnel Review (NTPR) program was established by DNA to carry out these responsibilities.

Scope of NTPR Program.

The Nuclear Test Personnel Review Program specific tasks are to:

- Compile a roster of the DoD personnel involved in the atmospheric nuclear tests.
- Develop a history of each atmospheric nuclear event that involved DoD personnel.
- Declassify all possible nuclear test related source documents which formerly bore a security classification.
- Provide estimates of atmospheric test radiation doses -- both as a check on film badge readings and as a substitute for them in those cases where badges were not worn or readings were not recorded or are not retrievable.
- Establish personal contact with as many test participants as possible.
- Identify those individuals who received a higher radiation dose than those doses recommended under current Federal guidelines for radiation workers, notify those individuals of their dose

and offer them free medical examinations at Government hospitals.

- Sponsor, in conjunction with the Department of Energy (DOE), an independent mortality study by the National Academy of Sciences (NAS) of test participants selected by the NAS.

- Carry out a detailed research program, in conjunction with the on-going NTPR Program, to recover all data pertaining to possible radiation exposure of U.S postwar occupation troops at Hiroshima and Nagasaki, Japan. (This item was added to the original NTPR tasks in 1979 when concerns arose that veterans of the postwar occupation of those cities might be experiencing adverse health effects. Thus, since the Autumn of 1979, DNA has carried out a detailed research program to recover from records, historical documents, and interviews all possible data pertaining to the possible radiation exposure of those occupation troops.)

- Provide assistance to the veteran, the Veterans Administration (VA), and other organizations by doing individual research and by providing as complete data as possible on individual participation and radiation doses.

The overall NTPR effort is directed by the Defense Nuclear Agency, Washington, D.C. An NTPR team in each military service conducts detailed research into that service's participation in the atmospheric nuclear test program. A separate team at DNA's Field Command in Albuquerque, New Mexico has responsibility for research of records concerning DoD civilian employees and directs research into test participation by the former Armed Forces Special Weapons Project, a key test entity. In addition, DNA employs several contractors to provide specialized supporting services. The program has now been underway for five years, and about two more years will be required to complete the research. All phases of the NTPR program are being pursued on a high-priority basis, with adequate manpower (about 170 man-years per year) and funding (over $6 million per year). Its completion time is governed by the fact that necessary data are spread among hundreds of repositories and contained in tens or hundreds of thousands of documents.

NTPR Program Accomplishments

- First, the NTPR program has conducted most of the extensive research necessary to retrieve every possible bit of data about personnel participation and radiation exposure from records, archives, repositories, files, and other sources throughout the U.S. in order to piece together a coherent, personnel-oriented history of the atmospheric test program. The historical volumes (organized by series and shot, showing which organizations were there, what these organizations were doing, what radiological safety precautions were taken, what radiation dose levels were present, and other information) will be distributed to over 700 locations (including many public libraries) throughout the U.S. The order of publication of these historical reports is:

CONUS Operations	Actual/Projected Publication Date	Oceanic Operations	Actual/Projected Publication Date
PLUMBBOB (1957)	Oct 81	WIGWAM (1955)	Oct 81
TEAPOT (1955)	Mar 82	CASTLE (1954)	Apr 82
UPSHOT-KNOTHOLE (1953)	Apr 82	ARGUS (1958)	Dec 82
TUMBLER-SNAPPER (1952)	Apr 82	REDWING (1956)	Jan 83
RANGER (1951)	Apr 82	IVY (1952)	Feb 83
BUSTER-JANGLE (1951)	Dec 82	HARDTACK I (1958)	Apr 83
HARDTACK II (1958)	Jan 83	DOMINIC I (1962)	May 83
DOMINIC II (1962)	Feb 83	GREENHOUSE (1951)	Jun 83
TRINITY (1945)	Feb 83	SANDSTONE (1948)	Sep 83
PLOWSHARE (1962)	Mar 83	CROSSROADS (1946)	Nov 83

Participants who have written or called will be notified when volumes of concern to them have been published and informed of the location of libraries to which distribution has been made. This research/historical report production effort will continue until all atmospheric nuclear weapons tests have been documented and the historical volumes have been distributed.

Of the estimated 220,000 DoD participants in the tests, nearly 95 percent have been identified by name, and preliminary dose information has been recovered for about 134,000. The military services are reconstructing rosters from morning reports and ships' logs, searching medical records and other radiation dosimetry repositories, and identifying units' activities and movements. A product of this research will be listings of participants and their radiation dosimetry information for each series and shot; however, general release of these lists will not be made in order to protect

personal data of individual participants.

- Second, more than 750 formerly classified documents containing information pertinent to the personnel aspects of atmospheric nuclear tests have been declassified. More than 670 of these documents have been catalogued for easy reference by former participants, the VA, and others and placed at the National Technical Information Service (NTIS) for ready public availability. NTIS is an agency of the Department of Commerce and offers these unclassified Department of Defense publications for sale along with other documents. The address and telephone number is: National Technical Information Service, 5285 Port Royal Road, Springfield, Virginia 22161, telephone 703-487-4650. If assistance is desired concerning the acquisition of material, most large public libraries are aware of NTIS and can assist in obtaining documents. The NTIS sales desk telephone number can also be called by any individual. If the exact report desired is not known, an NTIS subject analyst may be able to provide assistance. Moreover, most of the other unclassified documents have been placed at the Department of Energy Nevada Operations Office Coordination and Information Center, Las Vegas, Nevada.

- Third, the NTPR dose reconstruction program has proven to be of great value. It has been used to check the validity of film badge readings (with excellent correlation), to calculate doses for participating groups, and to reconstruct individual doses in specific cases (as in VA claims). As part of this effort, a separate analysis of possible exposures due to inhalation and ingestion of radioactive materials is being done. A later section of this fact sheet discusses dose levels to which participants in the atmospheric nuclear test program were exposed.

- Fourth, the NTPR program operates a toll-free telephone line (800-336-3068)* for test participants to report their involvement in the tests. Information provided by participants has significantly aided in the research and development of a permanent, computerized data base. To date, about 49,000 test participants have called or written DNA.

- Fifth, the individual notification and medical examination program for all individuals who received doses higher than 5 rem** is being carried out in segments, as described below:

  - In March 1979 a notification and medical examination program was initiated for all DoD test participants with cumulative doses from atmospheric testing in excess of 25 rem. The threshold of 25 rem was selected because it is the current recommended national guideline for one-time, planned exposures under emergency conditions. The National Council on Radiation Protection and Measurements evaluates the 25-rem threshold in the following terms in their NCRP Report No. 39 (p. 102):

> Since planned whole-body doses up to 25 rem are reasonably accepted for emergency conditions ..., it follows that accidental doses up to the same magnitude should not cause major concern. At higher levels and especially where the whole-body dose reaches 100 rem, medical observation and subsequent actions based primarily on medical opinion are the important aspects.

The NTPR program has identified a total of 39 DoD personnel in the over-25-rem group, with doses ranging from just over 25 rem to an estimated high of 98 rem. Most of these were exposed as a result of a wind shift at Shot BRAVO during Operation CASTLE at Bikini in 1954. Four of the 39 are known to be dead from causes not associated with radiation (i.e., trauma, heart attacks). Of the remaining 35 who were all notified, 18 desired physicals, 7 did not want examinations, and 10 have not responded. Of the 18 examinations which have been scheduled, we currently have received the results of thirteen. No adverse health effects associated with radiation exposure at the atmospheric nuclear tests were found during these examinations.

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* In Virginia, Hawaii, and Alaska call collect to (202) 274-9161.

** A rem is a unit of radiation dose equivalent and reflects the radiation energy deposited within the body tissue and its capability for causing an effect.)

- In May 1979, the notification and medical examination program was expanded to include the DESERT ROCK Volunteer Observers (Officer Volunteers). These 44 volunteers received gamma doses ranging from a few millirem to about 17 rem; however, they were closer to ground zero than any other participants at the time of detonation. The officer volunteers at shots NANCY, SIMON, BADGER, and APPLE II were also exposed to neutron radiation.

- In June 1979, after careful evaluation to ensure the over-25-rem program was functioning well, the notification and medical examination program was expanded to include all participants identified with annual doses in excess of 5 rem. This threshold was chosen both because 5 rem is the current Federal guideline for allowable annual dose to radiation workers and because it is the best single standard to represent permissible dose levels for most DoD personnel at the time of the tests. Notification of participants is based not only on film badge records but also on dose calculations or dose estimates, if these show a possible over-5-rem dose. It is estimated that about 1,100 DoD personnel will be involved.

- Throughout the course of the NTPR effort, the VA has had a program in effect whereby any eligible veteran test participant is given a free medical examination upon request.

- Sixth, the National Academy of Sciences is well into its third year of work to ascertain whether atmospheric test participants exhibit any adverse health effects which might be attributable to test participation. It is conducting a scientific follow-up study of over 50,000 DoD participants in Operations GREENHOUSE (1951), UPSHOT-KNOTHOLE (1953), CASTLE (1954), REDWING (1956) and PLUMBBOB (1957).

- Seventh, the Defense Nuclear Agency has completed research on the U.S. occupation of Hiroshima and Nagasaki. A detailed fact sheet on this has been produced and is being provided to all occupation personnel who have called or written to DNA. A detailed dose reconstruction--using numerous assumptions which would maximize dose--has also been completed. No areas of concern or significant doubt were identified, and the firm, well-substantiated conclusion is that the radiation doses received by members of the Hiroshima and Nagasaki occupation forces were negligible. DNA's research has disclosed no basis for concern by veterans of the Hiroshima and Nagasaki occupation forces over an increased risk of adverse health effects due to radiation during the occupation. In May 1981, the National Academy of Sciences convened a panel to review the occupation of Hiroshima and Nagasaki and to determine the feasibility and desirability of performing epidemiological studies of veterans who served in the occupation forces in Hiroshima or Nagasaki, Japan, immediately following the wartime bombing of those cities. The National Academy of Sciences panel concluded that:

(1) Scientifically sound studies of morbidity among military personnel who entered Hiroshima or Nagasaki soon after the bombings are impractical.

(2) Studies of mortality among these men, from a strictly scientific point of view, appear to carry inordinate cost in relation to the potential benefit.

(3) No study of the population in question could detect effects that would be predictable from existing knowledge of health hazards associated with radiation exposure.

(4) Even if an excess number of cases of multiple myeloma is present in this population of veterans, this cancer is unlikely to be attributable to ionizing radiation. (The NAS is currently investigating, for purposes of verification of diagnosis, the alleged cases of multiple myeloma).

- Finally, the Service NTPR teams have collected extensive basic information about each series and shot of the atmospheric test program in which that military service had any identified participants. They have also organized and trained their research teams in accessing individual service and medical records. They provide effective claims assistance to individual veterans and to the VA. The VA notifies DNA of all test participant veterans' claims and requests assistance in documenting participation and determining radiation dose, if any. The Service NTPR teams research all claims for the VA which have involvement in the atmospheric nuclear tests as the basis.

Dose Levels in the Atmospheric Test Program

Research to date indicates that most recorded doses to DoD personnel during the tests were quite low--averaging about half a rem. Of course, many participants received no dose at all, and only a

very small percentage exceeded 5 rem per year, the current Federal guideline for allowable annual dose to radiation workers. The most basic source of dose data is the file maintained by the Reynolds Electrical and Engineering Company (REECo), a contractor of DoE (AEC), which is the official master repository of dose records for the atmospheric nuclear weapons tests. These REECo files, which contain the records of both DoD and AEC personnel, show the following:

REECo Film Badge Entries
(1945-1962)

Dose	Number of Entries	Percent of Entries
Zero	96,942	42%
One rem or less	204,952	88%
Three rem or less	225,765	97%
Five rem or less	230,984	99%
All	232,303	100%

NTPR Cross-checks on Exposure Levels

To cross-check the accuracy and completeness of the dose data held by REECo, and to ensure that it is representative of DoD participants, the NTPR program conducted numerous separate research efforts on exposures. Examples are:

- Research into historical documentation of numerous individual shots and test series shows dose results similar to the REECo averages. For example: In DESERT ROCK I (Nevada, 1951), none of the participants received over 5 rem; in BUSTER-JANGLE (Nevada, 1951), 0.2 percent received over 5 rem; in TUMBLER-SNAPPER (Nevada, 1952), 1.2 percent received over 4 rem; in TEAPOT (Nevada, 1955), 0.5 percent received over 3.9 rem.

- The Navy NTPR team extracted from REECo files the dose records of former Navy personnel who participated in oceanic testing. Of these individuals, 37 percent received zero exposure and less than one percent received more than 5 rem. In a separate research effort, the Navy conducted a reliability check of radiation dose records obtained from 7,900 individual medical records. Tabulation of the dose showed that less than one percent received more than 5 rem.

- Dose reconstruction was accomplished on Shot SMOKY to check on the accuracy of film badge readings (i.e., to see if test participants might have received larger radiation doses than their film badges recorded). Good correlation between actual film badge readings (0.575 rem average) and the calculated dosage (0.480 $\pm$ 0.135 rem) gives considerable confidence in film badge accuracy.

- Dose reconstructions have been done on other shots and series, and all support the data contained in the REECo files.

- Spot checks were made of film badge readings for members of units which maneuvered in proximity to each other and thus should have received comparable exposures. The results were indeed comparable.

- Intensive research and analyses have been carried out regarding possible neutron exposures, since neutrons would not be recorded on film badges. Dose reconstructions indicate that individuals with significant neutron exposure were officer volunteers. All cases where there was a potential for significant neutron exposure has been investigated in detail.

Based on cross-checks such as these, one can be confident that radiation dose levels shown by the REECo master file data (i.e., an average dose of about half a rem for all participants, and less than one percent with doses above the current allowable annual Federal standard) are reasonably representative of all DoD personnel. The identification and quantification of possible exposure due to inhalation and/or ingestion of radioactive materials has been accomplished for a number of events. Thus far, there have been no indications of significant exposure. This effort is continuing.

Health Effects of Ionizing Radiation

Numerous authorities, national and international, have addressed in detail the health risks caused by radiation doses and have recommended standards of acceptable doses for radiation workers. It has been established that adverse health effects can result from exposure to high levels of ionizing radiation (e.g., 100 rem or more). However, it is not known whether or not there are deleterious health effects from exposure to low levels of ionizing radiation (i.e., a few rem). For many years, medical scientists assumed there were no adverse effects from low exposure, i.e., that a "threshold" level of ionizing radiation existed, below which no adverse health effects would be caused. In the 1940's and 1950's, medical scientists gradually shifted to the present hypothesis--that there is no safe threshold, that even low levels carry some slight statistical risk, and that the degree of risk increases linearly with dose. This conclusion, however, is a hypothesis and is based on observations following high levels of exposure. No firm evidence exists to show that exposure to low levels of ionizing radiation would cause adverse health effects. Following are some examples of pertinent statements by medical and scientific authorities:

- The most direct data for the specific issue of atmospheric test participants comes from the Interagency Task Force on the Health Effects of Ionizing Radiation, conducted at White House direction and submitted to the President in August 1979 by the Secretary of Health, Education and Welfare. Its report states:

> For example, in a population of 10,000, one may normally expect 1,600 cases of fatal cancer; exposure of each of the 10,000 persons to one rem of low LET*, low rate, external, whole body radiation may be expected, under current risk estimates, to increase those deaths to roughly 1,601 (June 1979, p. 35).
>
> Thus, at current risk estimates, each individual has an overall likelihood of dying from cancer of about 16 percent, but the risk of dying from radiation-induced cancer is only about .01 percent for each rem of low-level exposure. Stated another way, 1,600 out of 10,000 persons will eventually die of cancer from various causes, but only one out of 10,000 may be expected to die of radiation-induced cancer following radiation exposure of one rem (June 1979, p. 5).
>
> Estimates vary, but the DoD, which is conducting a major research project to identify this test population, believes that about 250,000,** DoD personnel (the great majority of them military) participated in these tests. While the actual exposure levels are under study, the current collective dose estimate is 115,000 person-rems at the Nevada and Pacific test sites. The currently assumed dose-response relationship for cancer would indicate about 12 excess cancer deaths from this estimated radiation dose over the lifetimes of the 250,000 involved (June 1979, p. 63).

- The International Commission on Radiological Protection (ICRP), the most prestigious international group addressing radiation issues, makes the same risk estimate in their 1977 Recommendations of the International Commission on Radiological Protection, ICRP Publication 26, which states:

> For the purposes of radiation protection involving individuals, the Commission concludes that the mortality risk factor for radiation-induced cancers is about 10^{-2} Sv^{-1}, as an average for both sexes and all ages (January 17, 1977, p. 12). (Note: a sievert (Sv) equals 100 rem, thus the above statement puts the risk at one cancer death per 10,000 persons exposed to one rem.)

ICRP Report No. 26 also states, with regard to these risk estimates, that:

*Linear Energy Transfer (LET) is the conventional expression for the rate of energy deposition measured along the track of an ionizing particle. Gamma rays and X-rays generate low-LET electron tracks. Alpha particles and neutrons generate high-LET tracks.

**Current estimate is about 220,000.

> The use of linear extrapolations, from the frequency of effects observed at high doses, may suffice to assess an upper limit of risk.... However, the more cautious such an assumption of linearity is, the more important it becomes to recognize that it may lead to an over estimate of the radiation risks.... Thus, in the choice of alternative practices, radiation risk estimates should be used only with great caution and with explicit recognition of the possibility that the actual risk at low doses may be lower than that implied by a deliberately cautious assumption of proportionality (p. 7).

- The United Nations Scientific Committee on the Effects of Atomic Radiation, in their 1977 UNSCEAR report, states:

> The average risk of inducing a fatal malignancy is thus taken as being in the region of 10^{-4} rad^{-1} ... (p. 6) (that is, one fatal cancer for every 10,000 individuals exposed to one rad).

This UNSCEAR report also states:

> It must be emphasized again, however, that such a value is derived essentially from mortalities induced at doses in excess of 100 rad. The value appropriate to the much lower dose levels involved in occupational exposure, and even more so in environmental exposures to radiation, may well be substantially less (p. 414).

- In 1980, the Committee on the Biological Effects of Ionizing Radiation (BEIR Committee) of the National Academy of Sciences issued The Effects on Populations of Exposure to Low Levels of Ionizing Radiation which updates their 1972 report. To illustrate risk calculations, the Committee considered two situations: a single exposure to 10 rads and a continuous, lifetime exposure of 1 rad per year. They found that the lifetime risk of cancer mortality ranges from 77 to 226 excess deaths per million per rad for the single exposure, and 67 to 182 excess deaths per million per rad for the continuous exposure. Thus for a single exposure to 10 rads, 770 to 2,260 excess cancer deaths are predicted per million people. The normal expectation of cancer deaths is from 160,000 to 170,000 per million. (pp. 191-192, 265) The 1980 BEIR report predicts a lower risk than their 1972 report. This is because they felt the linear response model used by the 1972 Committee to extrapolate from high exposure levels to low levels did not fit the epidemiological data from high dose exposures as well as the linear-quadratic dose-response model.

- The National Council on Radiation Protection and Measurements, taking cognizance of all available information on health risks, stated in their 1971 NCRP Report No. 39, Basic Radiation Protection Criteria:

> The maximum permissible prospective dose equivalent for whole body irradiation from all occupational sources shall be 5 rem in any one year (p. 89).

NCRP Report No. 39 also states:

> In the interest of estimating effects in humans conservatively, it is not unreasonable to follow the assumption of a linear relationship between dose and effect in the low dose regions for which direct observational data are not available. It is generally agreed that such an assumption is conservative and would tend to give upper limits for any particular effect (p. 55).

> Experience with occupational exposure in the general neighborhood of presently acceptable limits over the last two or three decades has shown no identifiable injury ascribable to radiation (p. 50).

The NCRP reaffirms this 5 rem per year standard in their more recent (1975) Report No. 43. This report also states:

> The NCRP continues to hold the view that risk estimates for radiogenic cancers at low doses and low dose rates derived on the basis of linear (proportional) extrapolation from the rising portions of the dose-incidence curves at high doses and high dose rates, as described and discussed in subsequent sections of this report, cannot be expected to provide realistic estimates of the actual risks from low level, low LET radiations, and have such a high probability of over estimating the actual risk as to be of only marginal value, if any, for purposes of realistic risk-benefit evaluation (p. 2).

- The actual U.S. Federal radiation exposure standards were established by the President in 1960, based upon recommendations by the Federal Radiation Council. These standards are somewhat less stringent than the NCRP recommendations, in that they allow 3 rem per quarter, or 12 rem per year, until an accumulated dose equal to 5(N-18) is reached (where N is age in years). For example, a 26-year-old could, within today's Federal standards, receive doses of 12 rem per year for five years, thus accumulating 60 rem at the age of 30. Once the 5(N-18) limit is reached, allowable exposure is limited to 5 rem per year. The actual practice followed today however is to limit annual exposures to 5 rem.

- Nor is 5 rem per year a U.S.-only limit. The ICRP, an international body, also recommends an allowable exposure of 5 rem per year for occupational workers, and even condones 12 rem per year under infrequent conditions.

Summary

Based upon research to date, the average exposure of DoD participants in the atmospheric nuclear tests has been determined to be about one-tenth of the level that is generally agreed as an acceptable annual exposure for radiation workers; authorities widely agree in their assumption that the health risk from an exposure of half a rem is very low (approximately one fatal cancer per 20,000 individuals).

It should be noted that even today, 20-35 years after some 220,000 DoD personnel participated in the atmospheric test program, the only indication that there may be an increased health risk associated with test participation is CDC's identification of leukemia cases (now listed by CDC as nine) among participants whom CDC stated were present at the Nevada Test Site for Shot SMOKY, where the expected normal incidence in this group would be between three and four. (And, as stated earlier, CDC has not to date attributed this leukemia to exposure to ionizing radiation.)

The NTPR program is conducting a careful look into the history of the radiological safety aspects of the atmospheric nuclear weapons testing program and the development of historical documents to record the radiological exposures, if any, and to identify DoD personnel participation. The documents are now becoming available to the public at various libraries throughout the United States.

The careful and extensive study, so far, into the atmospheric nuclear test program indicates that overall the radiological safety precautions and safety measures taken, even in light of today's scientific knowledge of radiation effects, were adequate and there was only a very slight, if any, health risk to test participants.

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*    This Fact Sheet Updates Nuclear Test Personnel Review (NTPR)  *
*    Fact Sheet, 1 March 1982                                      *
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