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MEDICAL DIVISION
ARMY CHEMICAL CENTER
Maryland

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BAW 11/1

7 November 1949

SUBJECT: Medical Division Suggestions for Panel Discussion

TO: Army Secretary
Joint Panel on Medical Aspects of Atomic Warfare
The Research and Development Board
Department of Defense
Washington 25, D. C.

1. It is not certain that the undersigned will be able to attend the next panel meeting. The following matters are suggested for panel discussion:

a. The establishment of adequate tolerance dosage limits (civilian and military) for production of potable water from water contaminated with radioactive materials. Inclosure #1 indicates Army interests in this field. The interests of the AEC and of other governmental agencies are being considered by a committee which met this past summer. It reviewed various proposed research programs, particularly that of the Oak Ridge National Laboratory. The minutes of this meeting have not yet been circulated officially.

b. Another group concerned with water supply is the Panel on Hydrology, RDB Committee on Geophysics and Geography. This panel has prepared a report on "Quality of Water Supplies with Emphasis on Contamination and Decontamination", GHY 17/1, Draft 2, dated 20 September 1949.

c. The interests of this Division of the Chemical Corps in water supplies are described in three projects:

(1) 4-75-03-02 - Kit, Water Testing and Screening.

(2) 4-75-03-03 - Kit, Water Testing, Poisons.

(3) 4-75-05-01 - Purification of Water Contaminated by Chemical, Bacterial and Radioactive Substances.

The brief and objective of each is quoted in inclosure #2 from the RDB project cards.

Date 13 JUL 1981
Declassified
REC. MGT. DIV., WHS
Name Brian V. Kinney

Attachment (A), Other Business
Agenda, 3rd Meeting
Jt. Panel on Med. Aspects of Atomic Warfare

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d. The Chemical Corps has primary cognizance within the National Military Establishment for research and development on methods of dissemination of Radiological Warfare agents. The accomplishment of this mission requires that certain basic biological information be made available to the Chemical Corps. The basic biological information required by the Chemical Corps and considered to be of concern to this panel are summarized in question form in inclosure #3. The Chemical Corps is prohibited from doing the work to obtain the answers to these questions and must look to other agencies for the answers.

2. It will be appreciated if these matters are brought to the attention of panel members in so far as seems appropriate.

FOR THE CHIEF, MEDICAL DIVISION:

/s/
DAVID B. DILL
Scientific Director

3 Incls.:
#1 - Extract of Research Program
#2 - Description of Med. Div. Projects
#3 - Questions re RW Program

BAW 11/1.1

E X T R A C T

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A PROGRAM FOR RESEARCH IN DECONTAMINATION OF RADIOACTIVE WATER SUPPLIES FOR CIVILIAN AND MILITARY USES

* * *

On the Army falls the heaviest responsibility for military and civilian protection against contamination of water supplies by radioactive materials. The Navy and Air Forces have special responsibility for protecting their own personnel, but in general use equipment developed by the Army or in close cooperation with Army specialists. As submitted by a representative of the Chemical Corps, the responsibilities of agencies of the Department of the Army in connection with programs of purification of water contaminated with radioactive materials have been established as follows:

1. "The Army is responsible for furnishing potable water to troops to include production of potable water from water contaminated by radioactive materials. In the event of failure of civil water purification systems due to radiological contamination the Army will be called upon to furnish stop gap discontamination or purify potable water until such time as civil water purification systems are again effective."

2. Chemical Corps

   a. The Chief, Chemical Corps, has primary cognizance within the Department of the Army for research and development in the field of offensive (excluding the A Bomb) and defensive radiological warfare to include decontamination. The Chemical Corps is also responsible, within the National Military Establishment, for the development of means of dissemination of radiological warfare agents. The Chemical Corps, in accordance with the above assignment of primary cognizance for radiological warfare, is responsible for the water purification program within the Army for the production of potable water from water contaminated with radioactive material.

   b. The Chemical Corps, as an extension of its responsibilities for radioactive agents, will be responsible for furnishing information as to the nature and types of radioactive materials which may be found in water contaminated by radiological warfare agents.

Inclosure #1

c. The Chemical Corps will determine the adequacy of the available information for the decontamination of water contaminated with radioactive materials and obtain additional information, if necessary.

d. The Chemical Corps will assist in the evaluation of Corps of Engineer equipment for the purification of water from radioactive materials. It is contemplated that water purification methods, processes and agents to be used in engineer equipment will have to be evaluated on a laboratory scale prior to taking in standard and development engineer equipment. The degree of radioactive contamination before and after contamination will have to be ascertained.

e. The Chemical Corps will develop and evaluate methods, procedures and materials to decontaminate water supplies from radioactive materials, and possible simultaneously from BW, CW, and RW contamination.

3. Corps of Engineers

The Corps of Engineers is responsible for the development and application of apparatus and equipment for the purification of water contaminated by radioactive materials for the production of potable water.

4. Medical Department

The Medical Department of the Department of the Army (Surgeon General's Office) should establish for the Army the tolerance dosages or safe limits for radioactive contamination of water supplies.

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Project	Brief and Objective
4-75-03-02 - Kit, Water Testing and Screening	The objective and plan for this project is to incorporate into the present Kit, Water Testing and Screening, a practical test for agents of the G series which will indicate clearly whether or not water so contaminated is drinkable without danger to personnel; to improve the sensitivity of the DB-3 contained in the kit, whether in pellets or in some other packaged form; to redesign the container and content spaces to conform with current Medical Dept. packaging standard sizes; and to review, in collaboration with AEC, practical means for detecting radiological contamination.
4-75-03-03 - Kit, Water Testing Poisons	The objective and plan for this project is to revise the present kit, based upon the approved military characteristics, in order to correct existing deficiencies. More specifically it is proposed to: (1) Incorporate a suitable test for the nerve gases into the kit; (2) Correct deficiencies of storage and corrosion; (3) Improve the stability of the component reagents; and (4) Improve the carrying strap and change the size of the kit to conform to Medical Department standards. The most satisfactory prototype kit will be sent to the Medical Department for service testing and appropriate classification action.
4-75-05-01 - Purification of Water Contaminated by Chemical, Bacterial and Radioactive Substances	The objective is to develop techniques, treatments, and materials for providing the most effective means of decontamination and purification of water contaminated with chemical, biological, or radiological warfare (radioactive materials) contaminants, to render such water potable within the permissible

Inclosure #2

BAW 11/1.2 -- continued

4-75-05-01 (con'd)

limits of toxicity. This includes such necessary research for the development indicated as falls within the responsibility of the Chemical Corps. A study of the properties of BW, CW, and RW contaminants in water will be made to find a single field method that will effectively remove all such agents. Standard treatments, material, and equipment for water purification will be investigated and, if these fail, new treatments, methods, and materials will be developed. All available research programs concerned with furnishing potable water to troops will be reviewed and analyzed. It is contemplated that the Biological Department of the Chemical Corps will furnish biological toxicity data, and that collaborative arrangements with the Biological Department will eliminate duplication of effort in the purification of water from BW contaminants. The Atomic Energy Commission is conducting research in the field of RW toxicity, which will be evaluated for removal of radiological contaminants from water down to within the permissible limits of radiological toxicity established for potable water. The purification or decontamination of water from radioactive contaminants involves the necessity for laboratory evaluation of water purification; the effect of these contaminants on water purification equipment and the problems of waste disposal of such contaminants. This project will be closely coordinated with the Corps of Engineers in connection with Engineer Corps water purification equipment, materials, and treatments.

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RADIOBIOLOGICAL QUESTIONS ARISING
IN CHEMICAL CORPS RW PROGRAM

29 August 1949

1. How much external gamma radiation (0.3 to 1.7 MEV) administered within one hour to unshielded troops, by whole body radiation, is necessary to incapacitate approximately 50% of the exposed troops within a period of approximately:

a. One hour?
b. One day?
c. One week?
d. One month?

2. For the above dosages, approximately how long would incapacitation for combat military duties persist in each case, and which dosages would probably be lethal? If lethal, approximately what percent of the exposed personnel would be expected to die, and how long (range and average) might the fatal cases be expected to survive?

3. How much gamma radiation (0.3 to 1.7 MEV) obtained within one hour by unshielded troops, would be acceptable as a military risk for our own troops:

a. To result in no decrease of combat efficiency?
b. To result in some decrease of combat efficiency, not to exceed 10% temporary casualties and with no permanent casualties?

4. How much gamma radiation (0.3 to 1.7 MEV), obtained by airplane crews in 4 to 8 hours, from a partly shielded RW load aborad the plane, would be acceptable as a military risk:

a. To result in no decrease of combat flying efficiency?
b. To result in no decrease in flying efficiency during the mission (8 to 16 hours), and not to exceed 10% temporary casualties after completion of the mission, with no permanent casualties?

5. In the two cases of exposed air crews, paragraph 4, how long an absence from exposure to radiation is required before the same men may safely undertake a duplicate mission without increased susceptibility due to former exposure?

6. In the case of repeated exposure of air crews, as above, what is the total reasonable limit of exposure to gamma radiation to still affect neither:

a. Incapacitation for combat flying during a war period of five years, nor,

Inclosure #3

BAW 11/1.3 -- continued

b. shortening of the life span by more than a maximum of about 5%?

7. What length of time can a plane area of indefinite extent, radiating gamma rays (0.3 to 1.7 MEV) at 15 r/day, 30 r/day, 60 r/day, and 120 r/day measured at one meter above the ground, be occupied by unshielded troops:

a. To result in no decrease of combat efficiency?
b. To result in some decrease in combat efficiency, but not to exceed 10% temporary casualties?
c. To result in mild temporary incapacitation of 50% or more of the occupying troops?
d. To result in severe or lengthy incapacitation of 50% or more of the occupying troops?
e. Result in about 50% fatalities?

8. Will any fatalities or permanent injuries probably result from the amounts of gamma radiation specified in subparagraphs 7c and d above? If so, approximately what percentage of each might occur among those so exposed?

9. To avoid cumulative effect, what length of time is required for troops, who have been exposed to gamma radiation to lose all increased susceptibility to a subsequent exposure to gamma radiation, so that in a practical military sense, the subsequent exposure will present no greater hazard to them than if they had not been previously exposed? How does this vary with the exposure time and total dose (dose - rate), and with the energy of the gamma ray (0.3 to 1.7 MEV)?

10. Does exposure to gamma radiation significantly increase the susceptibility of troops to BW or CW agents? If so, how much gamma radiation, delivered to unshielded troops in one hour, would be required to double susceptibility to the principal lethal CW agents, and the principal lethal and/or infectious BW agents?

11. What are the relative orders of resistance, qualitatively and quantitatively, of the following body tissues to acute injury by beta radiation, when the radioactive material is placed directly upon them:

a. Skin (in general).
b. Thick skin of the palms of the hands and soles of the feet.
c. Mucous membranes of the nose, mouth, and accessory sinuses.
d. Lining membranes of the trachea and larger air passages.
e. The lower respiratory tract.
f. The tissues of the exterior of the eye, including the eyelids.

BAW 11/1.3 -- continued

12. What amount (in millicuries) of a non-absorbable beta emitter will produce the following results when ingested by adult human subjects:

a. No significant gastro-intestinal injury.
b. Mild gastro-intestinal injury, lasting a few days, in about 50% of the cases.
c. Severe gastro-intestinal injury in about 50% of the cases.
d. Fatal gastro-intestinal injury in about 50% of the cases.

13. In the cases specified in subparagraph 12b, above, is it probable that any severe gastro-intestinal injuries or deaths will occur? If so, what percentage of each is probable?

14. In the cases specified in subparagraph 12c, above, is it probable that any deaths will occur? If so, approximately what percent are apt to die, and about how long will they survive before dying? What are the approximate limits of length of disability among the severely injured cases which survive?

15. Does the energy of the beta ray, specified in paragraph 12, above, significantly influence the amount and/or severity of gastro-intestinal injury produced by a given total dose (in millicuries) of radioactive material? If so, what is the approximate quantitative relationship?

16. What is the effect of the degree of dispersion of the beta emitter on the results of paragraph 11? For example, will a given quantity of emitter be more effective in the alveoli as a point source or spread over a considerable surface?

17. What are the acutely lethal quantities by inhalation of a variety of absorbable beta emitters and their compounds?