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BLAST AND THERMAL ANALYSIS IN SUPPORT OF RADIATION STUDIES
IN ABCC

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In 1956 discussions among ORNL, LASL, School of Aviation Medicine, USAF, the Division of Biology and Medicine and others indicated that more attention might well be directed to improving knowledge of radiation dose received by survivors in Hiroshima and Nagasaki and of special interest as case histories in the ABCC program. In May 1956 a group including representatives from ORNL, LASL, DBM and NAS-NRC visited Hiroshima and Nagasaki and recommended a three-phase program on radiation dosimetry for human exposures. The first phase included laboratory work and literature search to determine the basis of estimates used at that time in assigning doses to ABCC case histories. The second phase was to include laboratory work and participation in full-scale atomic tests to study the attenuation of bomb radiations in the air, the angular distributions of such radiation and the shielding provided by typical Japanese houses for those inside the shielding provided by such houses and individuals in the open and shielding provided for individuals in the open and on uneven terrain. The final phase was expected to be the firing of reconstructed Hiroshima and Nagasaki weapons. The program has been carried under the technical direction of ORNL and has been successful in improving confidence in radiation dose in free air and to individuals in certain shielding categories. As the program has progressed there has been increasing concern as to possible bias in using the results because of more conventional injuries from blast and thermal effects. This view is shared by Dr. Walter S. Snyder, Asst. Dir.,

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Health Physics Division, ORNL, and by Dr. G. S. Hurst. On February 17, 1960 Dr. Snyder wrote to me saying, "I believe the conventional bomb hazards (burns, blast cuts, etc.) bias the Hiroshima and Nagasaki data on early effects. It is difficult but may not be impossible, to correct this bias in some cases." A study initiated in 1954 in Japan by Dr. J. J. Lewis was directed to the identification and evaluation of injuries from blast and thermal to the Japanese survivors. We have been unable to determine up to now whether the work was completed subsequent to his separation from the NAS-ABCC project in late 1955 or early 1956. With the foregoing as background a meeting was held in Washington on May 18, 1960 on blast and thermal analysis in support of radiation dosimetry studies of Hiroshima and Nagasaki survivors. Included among those present were Dr. Keith Cannan, NAS, Dr. C. L. Dunham, Director, DBM, Dr. Walter S. Snyder, ORNL, Dr. Clayton S. White, Lovelace Foundation, Dr. Herman E. Pearse, University of Rochester, and Dr. W. Ham, University of Virginia. A series of statements by each of the representative groups recognized the importance of the work of the ABCC and the need for utilizing to the fullest extent possible the laboratory and field data collected under AEC and other programs. In evaluation of results from the ABCC it was clear that the work in Japan has been primarily concerned with the radiation effects with little attention to the blast and thermal problem. Since the 1945 detonations in Japan there have been in the U.S. many lab and field studies related to blast and thermal and the results of this work now justified a closer examination of possible ways and means for correlating

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these data with the findings of ABCC. It was considered to be particularly important that efforts be made to remove any bias that might be produced in the evaluation of the radiation dosimetry data. Insofar as could be determined it did not appear that there would be any need to request ABCC to undertake any large additional medical examination of surviving population and that most of the impact on ABCC will result from the need for access to their many files, particularly to the early medical records and resultant follow-up x-rays. It was agreed that (1) the radiation dosimetry studies of the Japanese survivors now being conducted by the ORNL will be much more meaningful and the data less subject to criticism if a program can be developed to remove the bias introduced by possible injury from blast and thermal; (2) there are sufficient laboratory and field data on blast and thermal to permit (a) the preparation of preliminary free-field blast and thermal curves of the Hiroshima and Nagasaki bursts; (b) of preliminary "exposure dose" to blast and to unshielded survivors; (c) the estimation of preliminary exposure dose to blast and thermal to some shielded survivors; (d) medical evaluation of the significance of the blast and thermal exposure; and, (e) some correlation of field and laboratory animal studies with data developed by ACC. On the basis of the foregoing a letter was sent by Dr. C. L. Dunham to Dr. Cannan on May 27 stating that an effort to identify and evaluate the blast and thermal effects will increase the value of the ORNL radiation studies by assisting and removing a possible bias which will otherwise exist and the program would proceed as follows: (1) Dr. White, Lovelace Foundation, and Dr. Pearse,

University of Rochester, will make an early visit to ORNL to examine shielding histories and other data to determine the kind of medical information contained, that is, severity of burn, area of the body it covered, fractures, etc. Also, they will arrange to visit the Armed Forces Institute of Pathology to examine the very early records available and (2) ORNL will make available the best estimates of yield and the meteorological data prevailing at the time of burst which will permit the preparation of some preliminary free yield blast and thermal curves that will be companions of the radiation curve previously published by ORNL; (3) Oak Ridge will identify some sample cases in the radiation studies. As may be necessary, DBM will request NAS-NRC to obtain copies of medical records for examination by Drs. White and Pearse; (4) a written summary of the program up to that point will be prepared to serve as a basis for discussion by Dr. Cannan and Dr. Darling on the observations of the program and the assistance required of ABCC. As background for new ACBM members and to bring up to date for older members, Mr. Corsbie presented a series of slides and comments on the refinement of knowledge on blast and thermal effects since the establishment of ABCC in 1946 and preparation of the early medical records. This part of his presentation dealt particularly with present criteria for blast and thermal casualty production and present LD-50 concepts for primary, secondary, and tertiary blast effects as well as some information on LD-50s for thermal effects based on treated patients. These remarks, while covering a wide range of yields, were also directed to the wide difference in gamma neutron ratios of the weapons fired over Hiroshima and Nagasaki.