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COMMENTS ON UTILIZATION OF STRONTIUM-90 IN FUZES FOR ARTILLERY AMMUNITION

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a. Ground and air effects in view of the assumptions made by the Chemical and Radiological Laboratories

We assume that we are not requested to comment on the dispersion of radioactive materials which may be expected to result from their use in the device under discussion. We agree that Sr^{90} dispersed in air and upon soil in the concentrations assumed in enclosure 1, paragraph 3, would not, in general, provide serious hazards to military or civilian personnel. We have no basis for estimating the concentrations of activity to be anticipated on shell fragments, but feel that it is improbable that an individual would receive serious exposure from handling such fragments, particularly if he did not have open wounds on his hands.

Statement "g" of paragraph 3 of enclosure 1 appears to have been garbled in reproduction and we are unable to comment.

b. Plant and animal effects

Effects on plants and animals, as such, would be of no concern. In terms of the assumption of 6 microcuries per square meter given in statement "d", paragraph 3, enclosure 1, vegetation contaminated with Sr^{90} to this degree could not be safely used as food in large quantities (i.e., where it constituted a large fraction of the total diet of persons concerned). Crops grown on these areas after the material became confined to the soil would be much less hazardous.

We note that paragraph 4 of enclosure 1 states that conditions under which the device is damaged sufficiently to expose the Sr^{90} "present the greatest hazard, since in this case the possibility of ingestion of a large portion of the ... radioactive material becomes very great ... . In this case the ingestion would be sufficiently large that the individual would not only become a casualty but would also represent a great hazard to his fellows by the elimination from the body of a considerable portion of the radioactive material ... ." It is assumed that the author of these statements does not mean that there is a high probability that a large fraction of the radioactive content of any one of these devices would be ingested under these circumstances. This probability appears to be very remote. It may be observed that similar statements can be made concerning many non-radioactive poisons in common use. If such ingestion occurred, it would of course be very serious for the individual involved, but we do not believe that it would represent a more serious situation for his fellows than if the same material had been dispersed on the ground as assumed in "c", paragraph 3, enclosure 1.

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c. Sr^{90} retention characteristics of the human body considering nasal, oral and intravenous injection.

It is estimated that, under conditions normally encountered in exposure to radiostrontium, about ½ of quantities inhaled or ingested will be retained. This will vary with circumstances and with the individual involved. Quantities retained from intravenous injection may be somewhat larger. For comparable activities, Sr^{90} is more hazardous than most radioisotopes because of the relatively long length of time that it remains active in the body.

General Comments

Our estimate of the hazards associated with the use of Sr^{90} in the device under discussion is expressed qualitatively by the following statements:

(1) The radioactive material involved can be handled safely in manufacture and storage preceding final use. However, certain precautions are essential.

(2) Final use of the materials will result in degrees of contamination unacceptable in normal peace time operations.

(3) The hazards, both to military and civilian personnel due to the proposed use of these devices are very small compared to other hazards to which these personnel will be subjected in case of warfare.

(4) Levels of radioactive contamination resulting from wide scale use of these devices would be inconsequential compared to that which might be expected if nuclear weapons are used.

Biophysics Branch
Division of Biology and Medicine
AEC - May 21, 1954

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