

**Navy Requirements For NWE Research On
Physiological Effects of Radiation To Personnel**

Requirement

An important requirement exists to ascertain organ and system damage as related to human reception of ionizing radiation. The biological effects of personnel exposure to various levels and rates of ionizing radiation are pertinent to proper assessment of combat effectiveness concepts.

Operational Justification

This knowledge is necessary to establish (1) the time to incapacitation, (2) the relative sensitivity of tissue and organs to various types and energies of radiation, and (3) a threshold dose for total physical incapacitation. Required studies of operational ineffectiveness as a function of radiation dose (whether single or fractionated) of dose rate and partial to whole body exposure comparison, is established by NWP (28A) Nuclear Warfare Operations. The assessment of high energy neutron (14 MEV or greater) damage to the body is a specific requirement of the Marine Corps. This requirement is tied to the concept of employing low yield nuclear weapons in tactical situations. Investigation of a biological dosimeter, (i.e.; changes in specific amino acid levels within the body as a result of irradiation or reactions to preinjected drugs as a result of radiation exposure) would aid in establishment of radiation dosage levels.

Technical Justification

To meet the requirements enumerated above, the following research areas should be pursued to evaluate the tabulated effects:

- (a) *Radiation damage to specific body tissues (to assess and establish relative RBE's or QF's) in order to establish more accurate threshold doses for incapacitation to particular types and energies of radiation.
- (b) *Specific radiation damage (RBE) to various body tissues from high energy neutron (14 MEV plus) and the modification of the injury by shielding.
- (c) Study of total incapacitation and the dose required as related to time of relative ineffectiveness following radiation from weapons of known capacity and type of burst.
- (d) Recovery rate from injury caused by sublethal exposures of radiation from various weapon yields.
- (e) Evaluation of an LD50 within a period of seven days and performance decrement due to radiation generated from an air burst and surface burst.

*Related but not unique to NWER

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Enclosure (1)

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- (f) *Assessment of a more accurate rate of repair concept for the body as a whole, when exposed acutely and chronically to radiation of varying dose rates.
 - (g) *Development of an accurate biological dosimeter.
 - (h) The study of beta burns and gamma tissue injury resulting from fallout radiation fields on board ship or in combat situations.
 - (i) *A re-evaluation of radiation exposure curves, the types and times of incapacitation expected, and an overall generalization obtained for various dose levels.
 - (j) To evaluate the probable time of incapacitation and the length of time performance decrement will last due to psychological effects of radiation.

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