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Subtask No. 03.008 Subtask Title: Effects of Radiation on Sensory and Motor Functions of Rhesus Monkeys

Service Project No.: None
Directing Agency: US-ARDC
Laboratory: WRAIR
Contractor: None

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OBJECTIVE OR WORK STATEMENT: Objective of this research is the determination of the time course of behavioral response of trained monkeys during and following exposures to massive doses of radiation.

PROGRESS AND RESULTS: a. The investigation of the effects of 10,000, 20,000 and 40,000 r x-ray on nondiscriminative avoidance behavior has been completed and the results reported in WRAIR Technical Report #3 (Behavioral Radiology Laboratory). Briefly, the findings were that following 10,000 r x-rays many animals exhibited a decrease or cessation of responding for varying periods of time followed by a return to adequate response rates. This return was not to control levels but high enough to avoid nearly all shocks. It was at first thought the 20,000 and 40,000 r animals did not show this return. However, upon closer examination of the data and an altered method of data collection, it was demonstrated that some of the animals receiving these higher doses did go through a period of little or no responding followed by a short period of recovery. The most surprising finding, however, was a perfect rank correlation between survival times and the amount of rest the animals had prior to being irradiated. This finding has led to a formal investigation of this aspect of radio-protection. To date, 14 animals have been irradiated following a very stressful avoidance procedure. Various conditions of rest ranging from 15 minutes to 170 hours have been used. Early results have been most encouraging, e.g., stressed but well rested animals lived over 210 hours following exposure to 10,000 r. Control, non-stressed animals live approximately 85 hours following the same dose. The experiments studying the effects of ionizing radiation on visual acuity and brightness discrimination have progressed thusly: (1) The matching-to-sample techniques have been perfected. (2) The problems of collection of large amounts of data in a fashion compatible for computer analysis have been solved. (3) Baseline data on geometric and visual acuity problems have been obtained on one monkey. Further testing of this monkey on brightness problems must be conducted prior to irradiation.

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b. Results indicate that assessment of degree of incapacitation by the method used is dependent on a hitherto unsuspected factor which conceivably might afford a lead to reasons for variations in individual sensitivity. Success in determination of endpoints indicative of incapacitation in the monkey which would be used as a basis for extrapolation to man.

REPORTS PREPARED:

Sharp, J. C. and Daoust, L. The effects of massive doses of ionizing radiation upon conditioned avoidance behavior of the primate. YRAIR Technical Report #3, 1964 (in press).

Interim Reports: None

Estimated Date of Final Report:

Unknown, this is a continuing subtask.

PLANS FOR NEXT PERIOD: Because of the intrinsic value of the radioprotective effects of stress which have been followed by rest, this research will be continued. A study of the histopathology of the stressed monkeys will be carried out. If the protective effect is found to be as marked and as reliable as the initial data suggest, much more research on the biochemical and histological variables as well as the strictly behavioral variables.

Now that the matching-to-sample techniques have been perfected and the problem of data collection solved the primary task of determining the effects of massive and acute doses of x-irradiation on visual functions can be undertaken. However, because of the complicated training, only one monkey every six to eight weeks will be tested. Fortunately, the methods are of such a nature that relatively few animals will need to be tested at various dose levels.

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