

W.W. Biological Effects

W.W. Glosy

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...ic Health, University of Michigan.

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Effects of Ultra-High-Frequency Radiation on Animals

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The possible harmful effects of ultra-high-frequency radiation on those working near powerful transmitters has become of increasing interest. In a previous paper,¹ concerned with a study of rabbits subjected to periodic doses of 400 megacycle whole-body radiation, it was reported that there was no evidence of cataract production. This result was in distinct contrast to the effects of radiation of a higher frequency (3,000 megacycles), which readily produces cataracts in animals after intense local irradiation of the eyes.²⁻⁴

In this paper, the results are reported of pathological studies on these rabbits¹ and on rats irradiated under similar conditions. The data presented lead us to believe that if animals survive the effects of repeated irradiation, no pathological damage attributable to the radiation can be demonstrated. Our results do not preclude finding damage of a more subtle nature or of a variety for which we have not tested.

Methods

1. *Selection and Care of Animals.*—The procedure used for selection of rabbits to be irradiated, duration and intensity of irradiation, and measurement of power absorbed by rabbits is described in a previous paper.¹ Rats were handled in a similar way. All rats (male, Wistar) were

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housed and fed in identical fashion, and half of these were chosen by a random procedure for irradiation. Control and experimental rats were then kept separately, grouped six to a cage.

2. *Irradiation Procedure.*—With only one rat placed in the wave guide, it was difficult to make accurate measurements of the power absorbed, as the amount absorbed was a small fraction of the total power flowing in the system. For this reason, a Lucite holder was made consisting of six cylinders, closely packed, so that six rats could be placed close to the center of the wave guide. The figure for power absorption was obtained by averaging over the six rats, which were always weighed as a group on the day of irradiation. Rats which served as controls were weighed at weekly intervals. Rectal temperature measurements were made on one member of each group of six rats, before and after irradiation. In addition the eyes of each rat were examined with an ophthalmoscope before and after the series of irradiations. For examination of the eyes and for the autopsies, control and experimental animals were identified only by code number.

Initial experiments were carried out with another small group of rats to determine the lethal dose of radiation. This seemed to be higher per kilogram of body weight for rats than for rabbits. Rabbits will die after irradiation of about 60 mwatts* per square centimeter for 30-40 minutes. Rats seem to withstand this and die only when irradiation is in the range of 100-120 mwatts per square centimeter for half an hour. The average power absorbed at each exposure was 12±1 (s.e. of mean) watts per kilogram for rats given 100 mwatts per square centimeter for 30 minutes (Table 1, Group 1). For rats receiving 60 mwatts per square centimeter for 20 minutes, the average absorption was 8.6±0.2 watts per kilogram (Table 1, Group 2).

3. *Pathologic Methods.*—Rats were killed within two weeks after the last exposure. Each rat was anesthetized with ether and heart's blood withdrawn through an opened left femithorax. Hematocrit and white cell counts were determined, and gross observations were made. Tissues were fixed in 10% formalin and embedded in paraffin. After sectioning, they were stained with hematoxylin and

* Milliwatts.