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* Microwave Studies Demonstrate Behavioral Changes

Results of studies by the Bureau's Division of Biological Effects have demonstrated that under certain conditions exposure to microwave radiation may alter the behavior of laboratory animals.

In three separate experiments, scientists from the Division's Experimental Studies Branch explored the reported association between microwave absorption and behavior. Their goals were to investigate (1) the behavioral changes induced by the interaction of microwaves and a neuroactive drug, (2) the stimulus properties of microwaves in producing avoidance behavior, and (3) the possibility of using microwaves as a conditioning agent to produce an acquired taste aversion.

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To test the assumption that microwave-induced behavioral changes are a result of neurochemical changes produced by the radiation, four monkeys were injected with fenfluramine--an appetite suppressant that acts on the central nervous system--in dosages which, by themselves, did not alter behavior. The animals then were irradiated with 2450-megahertz continuous-wave radiation at up to 15 watts, a dose rate which had been shown to produce no change in their behavior. Although no changes had been observed after the administration of fenfluramine or microwaves alone, the combination of the drug plus irradiation produced severe disruptions in the behavior of three of the four monkeys.

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In the study to determine whether microwaves act as an aversive stimulus, the researchers exposed CF-1 mice to 2450-megahertz continuous-wave radiation at 2.7 watts. The exposure sessions lasted 30 minutes. The mice could respond by interrupting a beam of light that turned off or delayed the onset of exposure. Over repeated sessions, there was a significant increase in the frequency with which the mice performed the response that allowed them to escape or avoid the radiation.

Since it had been demonstrated that animals could learn to avoid microwaves, another study was attempted to determine if their aversion to the radiation would overcome their known taste for sugar. In this experiment, rats were allowed to drink a sucrose solution and then immediately subjected to a 15-minute exposure to 915-megahertz continuous-wave radiation. The average absorbed dose was 17 milliwatts per gram. When the rats were given access to the sucrose solution 24 hours later, there was no decrease in the amount consumed, indicating they had not learned to associate the aversive properties of the radiation with the sweetened taste of the water.

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In a third recommendation, the committee advised the Bureau to publish a notice of intent to study the feasibility of developing recommendations concerning the development and use of rare-earth phosphor screens in diagnostic radiology. This action stemmed from a Bureau briefing that noted the possibility of a 50-percent reduction in patient exposure for the same image quality with the new rare-earth technology. This, however, is compromised by lower image quality in most commercially available screen/film systems. For special clinical applications, such as magnification radiography and perhaps pelvimetry, the use of super-fast rare-earth systems with even greater dose savings may be indicated. The notice of intent would solicit information on these possibilities.

The Bureau informed the Committee that the above recommendations would be developed in a manner similar to those already issued or being prepared for

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specified and delivered dose. Participants also submit brief descriptions of the calibration and exposure factors used and their dose calculation methods.

The identification of individual facilities is kept confidential by NBS. The Bureau receives the dosimeter data coded by type of facility, State, type of accreditation, and other characteristics listed by the American Hospital Association.

Eighteen of the 20 survey rounds scheduled for the first phase of the study have been completed, with data available on 585 teletherapy units. Of the facilities contacted, approximately 65 percent agreed to participate.

Preliminary analysis of the data from the first 16 rounds, or 514 units, shows that 437 were located in hospitals, 45 in clinics or group practice facilities, and 29 in private offices. The units were almost evenly divided between Nuclear Regulatory Commission licensed sources and those licensed by Agreement States.

Data obtained to date on the average doses to the sets of dosimeters are now being evaluated.

The second phase of the study will consist of a resurvey of selected facilities. Included in the sample will be all facilities with dosimeter readings that differed from the specified value by more than 10 percent, half of those with differences of 5 to 10 percent, and 10 percent of those with differences of less than 5 percent. A special effort will be made to obtain the participation of 10 percent of the facilities which declined the first invitation.

The project is expected to be complete in September 1977. The final report, to be published early next year, will include recommendations regarding future programs to assure adequate calibration for precise therapeutic procedures.

communication in Title 21 of the Code of Federal Regulations. These include recommendations on the use of gonad shielding for diagnostic x-ray examinations, quality assurance programs for diagnostic radiology facilities, techniques for minimizing unnecessary exposure from mammography, and the use of x rays in pregnancy. In contrast to performance standards for products, these recommendations are nonregulatory and are intended to serve as guidance for the public.