NINTH YEAR PROGRESS REPORT
A. E. C. CONTRACT AT 11-1-3269
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TITLE: Alteration of Taste Thresholds by Low Doses of Ionizing Irradiation.
(Report covers period from May 1, 1972 to July 31, 1973)

- I. The original goals for the ninth year, as outlined in the previous renewal request, included the following:
 1. Correlate taste sensitivity change produced by X-irradiation with alteration in:
 - a. Transmission at the neurosensory junction.
 - b. Local protein synthesis and hydrolysis.
 - c. Increased concentration of heavy metal ions.
 2. Develop techniques for continuously monitoring thalamic taste projection afferents.
 3. Determine the effects of 150 R in utero X-irradiation on taste function in the adult rat.

In addition, work was to continue as follows:

1. Determination of the effects of a combination of irradiation and topical anesthetics.
2. To consider:
 - a. The following approach to reduce the likelihood of spurious or ambiguous results:
 1. Threshold "unstressed";
 2. Threshold after agent A;
 3. Threshold after radiation
 4. Threshold after radiation plus A.

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Where agent A is some reasonable environmental stress-agent already reported in the literature that produces the taste discrimination effect. These results will be repeated with animals under our experimental conditions.

b. The hypothesis that:

1. Agent A does not affect discrimination; refute by testing (1) and (2).
2. Radiation does not affect discrimination; refute by testing (1) and (2).
3. Radiation does not, when combined with A, affect discrimination; refute by testing (1) and (4).

Due to termination of the contract following this year and at a support level one-fourth of that requested, it was decided to revise the proposed objectives for the ninth year so as to select a portion of the contract that could be finished. Therefore, the revised objectives for the terminal year of support was as follows:

Determine the effects of 150 R in utero X-irradiation on taste function in the adult rat.

II. Accomplishments

1. Work Completed During The Ninth Year

Techniques that had been established during the previous years for producing in utero radiated animals with shielded contra-lateral horn siblings to act as controls were applied in determining the effects of in utero radiation on the animals taste acuity when an adult. The fetuses were delivered by caesarean section one day prior to term and then given to foster mothers who delivered one day before. At the time of caesarean section the fetuses were marked by clipping their tails. This was the only way that controls could be separated from the irradiated animals. Acceptance of the radiated animals with the foster mothers was somewhat unpredictable however, a 50% success rate of acceptance did occur. Several litters of animals were prepared in this manner and electrode implantations in the hypothalamus were

attempted. Unfortunately mortality rate of this surgery was exceptionally high in the radiated animals. It was uncertain whether the dose of radiation, 150 R on the eighteenth day of gestation, was responsible for this high surgical mortality or due to the stock of animals used. Several pregnant animals were obtained from animal supply houses and a lower dose of 100 rads of radiation was delivered to the fetuses on the eighteenth day of gestation. Two of these litters delivered at the end of the previous contract period and 12 animals reached maturity (200 grams) during this past year. Hypothalamic electrodes were implanted in all twelve animals and six survived the surgery. Only half of these animals would "work" to receive hypothalamic stimulation and their taste threshold for saccharin was determined (see Table I). 50 rads of 250 KVCP X-radiation was delivered to each animal's tongue through previously described techniques (see third year progress report). The threshold in each animal for saccharin was re-determined at periodic intervals following the irradiation (see Table I). Controls for this experiment were drawn from our previous taste threshold work. In addition, these animals were studied to determine if there is an alteration of the hypothalamic self-stimulation rates following in utero irradiation. This latter portion of the experiment is necessary to determine if the behavioral motivating system is intact following in utero irradiation. Again, controls will be provided by our previous experience with normal animals that we have used the proceeding eight years of this project.

2. RESULTS

Although there was a significant difference in the surgical survival rate following hypothalamic electrode implantation in rats who have received in utero irradiation, no difference in their taste threshold for saccharin could be detected before and after tongue irradiation. Naturally, this experiment was carried out in only 3 animals and a larger group will be necessary to prove this initial impression. It has also been our experience during the past eight years that approximately 90% of animals that survive electrode surgery will work for hypothalamic stimulation and can be trained to obtain a taste threshold. Yet only 50% of the six animals that survived surgery after in utero irradiation could be trained in our experiment.

Therefore, there may be a significant difference in the effect of hypothalamic stimulation in animals that receive in utero irradiation. Again, more animals will be necessary to prove this initial finding.

3. Summary

Animals that receive 100 R of in utero radiation on the eighteenth day of gestation -

- 1) survive hypothalamic electrode implantation poorly
- 2) exhibit a diminished response to hypothalamic stimulation
- 3) show no significant difference in their pre and post tongue radiation saccharin taste threshold.

Table I

Effect of Tongue Radiation on Saccharin Taste Threshold in Rats
Following 100 Rads of in utero Radiation on the 18th day of Gestation

Animals	Before Tongue Radiation	TASTE THRESHOLD				
		Days Post Tongue Radiation				
		1	2	3	4	5
Controls (non <u>in utero</u> radiated)	.001	.01	.010	.002	.002	.0015
<u>In Utero</u> Radiated (3 animals)	.001	.01	.005	.003	.003	.001