An Attempt to Produce Mutations by Sound

Since the pioneer work of MULLER[1], it has been known that X-rays and other radiations can produce mutations in the reproductive cells of animals. That high intensity sounds might be mutagenic has been suspected, but definite proof is lacking. HERSH *et al.*[2], studying visible mutations, obtained negative results when adult *Drosophila* were treated in a container immersed in an underwater ultrasonic field. FRITZ-NIGGLI *et al.*[3], likewise using ultrasonic frequencies but treating eggs, larvae, and pupae of *Drosophila* immersed in a gelled salt solution, found damage to the insects but no lethal mutations, as tested by the standard *ClB* procedure. On the other hand, WALLACE *et al.*[4] reported the production of lethal and visible mutations through treatment of adult *Drosophila* by ultrasound, but they gave no details of method. They later[5] reported nuclear destruction and chromosome fragmentation in plant materials treated with ultrasound. All these experiments utilized ultrasonic frequencies with various methods of treatment of the subjects, and the discrepancies in results could have been due to the differences in techniques.

As part of a general research program at this college on the biological effects of high intensity air-borne sound at high sonic and near-ultrasonic frequencies, it seemed advisible to study the possible production of mutations by high intensity sound at lower frequencies than those tried previously. Popular fear in some quarters of possible production of mutations in man by high intensity air-borne sound gave the study added interest.

The organism used for the work was *Drosophila melanogaster*, males of which were exposed to a high intensity sound field, at 6 Kc frequency, produced by the siren built by ALLEN and RUDNICK[6]. The induction of lethal mutations was tested by the standard *ClB* method. For the treatment, flies were mounted by fixing the wings to a small triangle of wax-paper attached to a glass rod[7]. Thus mounted they could be suspended at any desired place in the sound field. The insects were treated at two points in the sound beam, where the sound pressures were 154 and 163 db respectively (relative intensity 10^{-16} watts/cm^2). Untreated control flies were similarly mounted and suspended for corresponding times. After treatment, the flies were removed by cutting off the wings and were mated to *ClB* females.

The first experiments were made to determine the length of time of exposure to the sound a male *Drosophila* could tolerate. This was found to be about 45 min at 163 db, and two treatment times were therefore selected for use at this intensity: 40 min and 20 min. The treatment time at 154 db was 40 min. It was hoped that, if mutations appeared, any dependence upon time of treatment or intensity of treatment could thus be found.

The results of the experiments are given in the table. The "Number of treated X-chromosomes tested" refers to the number of F_1 *ClB* females which were bred to white eyed males to give the F_2. As this clearly shows, no lethal mutations were produced.

Treatment	No. of Treated Males	No. of treated X-chromosomes tested	No. of lethals
Controls	9	287	0
154 db, 40 min	11	317	0
163 db, 20 min	13	379	0
163 db, 40 min	19	478	0

This study obviously does not check that of WALLACE *et al.*[1], but the difference is probably due to differences in the methods of treatment. It is certain that in our experiments a large part of the sound energy was reflected from the body surface and was thus unavailable for effective action on the testes of the flies. This interpretation is supported by the fact that the flies were killed only after being in the sound field for 45 min. Roaches, for instance, which do absorb the sound and die as a result of internal heating, perish within a few minutes[2].

In mammals, the harmful effects of exposure to high intensity air-borne sound are almost entirely due to heating of the fur through absorption of sound[3]. In a relatively hairless mammal, such as man, the body surface reflects most of the incident sound, and protection is thus afforded. The results of the present experiment suggest that, in such a case, the possibility of harmful genetic effects through exposure to high intensity sound fields is remote[4].

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Zusammenfassung

Es wurde versucht, bei *Drosophila melanogaster* durch Einwirkung sehr intensiven Schalls (154 und 163 db; bei 6 kHz) eine Letalmutation zu erzielen. Die Experimente blieben jedoch ohne Erfolg.

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Sweet Taste in the Cat and the Taste-Spectrum

ZOTTERMAN has recently called attention to his inability to record action potentials from the taste fibres of the cat when sucrose solution was applied to the tongue[1]. These results, he noted, were supported by PFAFFMANN's[2] earlier study, although PFAFFMANN did not deny the existence of receptors for sweet substances in the cat. ZOTTERMAN explained his results by the statement that "the cat as opposed to the dog has no liking for sugar or sweet tasting food in general".

I have previously reported[3] that every animal which I had tested accepted sucrose solutions eagerly when

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