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Effect of X-rays of the eye of heterozygous Antennapedia flies.

In some Antennapedia ($Antp^R$) individuals irradiated with 1000r of X-rays, irregularities were found in the eye and head region, whereas no such abnormalities were found in unirradiated $Antp^R$ animals. These irregularities consisted of lumps of extra cuticle, bearing bristles which appeared in the region of the verticle or orbital bristles. The morphology of the supernummary bristles and the ground pattern was characteristic of this region of the head. The bristles often encroached upon ommatidia, causing the eye to be smaller. Frequently, a sector in the dorsal anterior part of the eye also contained bristles.

The frequency at which defects occurred in $Antp^R$ flies varied with the time of irradiation (Fig. 1), and

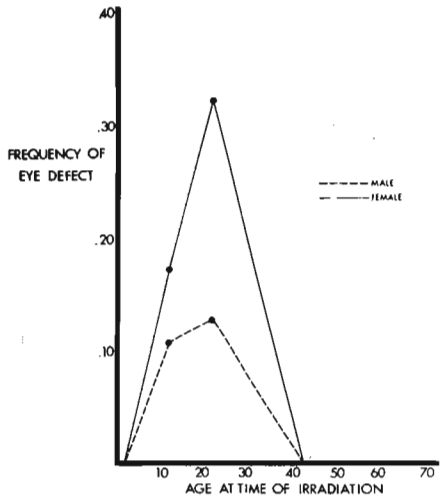

Fig. 1. Frequency of X-ray induced defects in the eye of $Antp^R$ flies vs. time of irradiation.

there was a peak at 24 hours after egg deposition. The penetrance of the eye defect was greater in females than males. In irradiated progeny of the cross y;mwh $Antp^R$/ mwh Sb Ubx X Df(1)sc^8, w^a/Dp(1;3)sc^{J4} and the cross $Antp^R$/Sb Ubx X y sn^3 f^{36a}, 72 of 383 $Antp^R$ individuals irradiated prior to 45 hours had defective eyes, while only 1 of 944 of their Sb Ubx siblings irradiated at this time had a defective eye. This indicates that the factor responsible for the eye defect is on the $Antp^R$ chromosome. Unirradiated $Antp^R$ flies did not show such irregularities in our experiments, nor did progeny of the cross y;mwh X Df(1)sc^8, w^a/Dp(1;3)sc^{J4} and y sn^3 f^{36a} X Oregon R irradiated with 1000r. Haskins and Enzmann[1], however, did obtain eye defects similar to the ones reported here after irradiation of an eosin stock.

Malformations of the head capsul without X-rays occur in D. melanogaster heterozygous for $Antp^{LC}$ [2], D. funebris bearing aristapedia[3], and D. hydei bearing ss^{Anp} [4]. The eye effect in D. funebris is more pronounced in females than males[3], as it was in our experiments. The gene erupt (er), also on the third chromosome, leads to a bristled structure protruding from the eye after irradiation of certain stocks at ten hours after egg laying. It is not known whether the eye defects reported here are due to the $Antp^R$ gene itself, or to some other locus, such as er, on the $Antp^R$ third chromosome.

References: 1. Haskins, D.P. and E.V. Enzmann, 1937 Amer. Nat. 71: 87-90; 2. Le Calvez, J., 1948 Bull. Biol. Fr. Belg. 82: 97-113; 3. Tiniakoff, G., 1939 DIS 11:52; 4. Gloor, H. and H. Kobel, 1966 Rev. Suisse Zool. 73: 229-252; 5. Glass, B., 1944 Genetics 29: 436-446.

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The alteration of X-ray induced genetic damage by aflotoxin in D. melanogaster.

The treatment of Drosophila flies with certain chemicals, and antibiotics prior to irradiation has altered the genetic damage (Sobels 1961, 1963, 1964, 1965; Burdette 1961, Clark 1963 and M.S. Rao 1965) and one of the methods offered for explanation was the inhibition of protein synthesis.

Aflotoxin is a collective name given to a group of highly toxic substances produced by certain strains of the mould Aspergillus flavus. The biological effects of this substance include: (i) inhibition of protein synthesis and also (ii) inhibition of m-RNA synthesis possibly through RNA polymerase.

With a view to find out whether aflotoxin would be able to alter the genetic damage akin to antibiotics experiments were undertaken to assess the alteration if any.

Oregon-K males of D. melanogaster were injected with 0.2 micro cc of saline solution containing 1 mg of aflotoxin dissolved in 1 cc of saline. The treated flies were exposed to

3000 r X-rays 24 hours after the injection. In the second experiment flies were exposed to 3000 r X-rays and then injected 0.2 micro cc of the saline solution containing 1 mg of aflotoxin dissolved in 1 cc of saline. Twenty-four hours rest was given before they were allowed to mate, in the second experiment (while in the first immediately after exposure to X-rays they were mated) individually with 3 virgin females of Y sc^{S1} In-49 sc^{8};bw;st stock for 3 days only to assess the alteration of genetic damage if any in spermatozoa alone. The F_1 females were mated individually with Y sc^{S1} In-49 sc^{8} males while the males were mated with bw;st females to score for sex-linked recessive lethals and translocations respectively in F_2 generation.

Table 1

Treatment	Sex linked recessive lethals			Translocations		
	T	l	%	T	t	%
3000 r X-rays						
3000 r X-rays	429	28	5.6	429	18	4.2
aflotoxin + 3000 r X-rays	477	17	3.5	411	13	3.1
3000 r X-rays + aflotoxin	468	27	5.7	433	16	4.6

T = total number of X chromosomes or F_1 sons scored
l = lethals recorded
t = translocations recorded

The Chi-square test has been done to compare the following groups: (1) 3000 r X-rays vs aflotoxin + 3000 r X-rays; (2) 3000 r X-rays vs 3000 r X-rays + aflotoxin. The results of the statistical analysis are presented in table 2.

Table 2

Group	Sex linked recessive lethals	Translocations
1. 3000r X-rays vs aflotoxin+3000r	2.139	0.172
2. 3000r X-rays vs 3000r+aflotoxin	0.863	0.137
3. aflotoxin+3000r vs 3000r+aflotoxin	2.358	0.0342

The study indicates that aflotoxin failed to alter the genetic damage induced by X-rays.

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Heterozygous effects in Drosophila melanogaster following treatment with ethyl methane sulfonate (EMS).

In an effort to assess the populational effects of a general rise in mutation rate, experiments are being conducted in our laboratory to measure the viability of heterozygotes carrying second chromosomes recently descended from flies fed with the chemical mutagen EMS. These experiments utilize special stocks isogenized over a period of several years which enable us to study the comparative effects of treated chromosomes in homozygous and heterozygous backgrounds. The isogenic stocks are: 1) cn bw, maintained by brother-sister single pair matings, 2) cn, maintained by backcrossing a cn female to a cn bw male from the above cn bw stock, and 3) bw, by similarly mating a bw female with a cn bw male. A cross between cn and bw flies from these stocks generates cn +/+ bw males, which are fed with EMS according to the procedure given by Lewis and Bacher (1968). Following treatment, these males are divided, without etherization, into three groups for mass matings with either 1) isogenic bw females, 2) isogenic cn, or 3) M-5 females, for a standard test of the induced frequency of sex-linked lethals. The males are removed after two days in order to sample treated mature sperm. From each cross with the isogenic females, wild type sons (cn +/+ bw) were selected and mated individually to either isogenic cn bw females or to cn bw;e females from a non-isogenic stock. In these cn +/+ bw males either the cn or bw chromosome was the one treated, according to whether the mothers were bw or cn, respectively. In the next generation, the progeny, cn +/cn bw and + bw/cn bw, are counted for each of two broods, in both isogenic and non-isogenic backgrounds, at each dose. Comparing the ratio of cn to bw in cultures where cn is treated to the same ratio where bw is treated gives a measure of the effect of treated chromosomes in heterozygotes, each set providing a control for the other, with the viability effects of these markers cancelling out.

Preliminary results pooled for experiments at 3 doses of EMS are tabulated here; each class is expressed as a mean proportion.