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TECHNICAL PROGRESS REPORT

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TOTAL RADIATION-INDUCED GENETIC DAMAGE IN ENTIRE GENOMES OF DROSOPHILA MELANOGASTER⁽¹⁾

Principal Investigator:

Seymour Abrahamson
Department of Zoology

Co-principal Investigator:

Ruby Valencia

Institution:

University of Wisconsin

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Project Abstract

Drosophila melanogaster adults are irradiated and then mated to flies containing genetic markers and/or crossover suppressors in all chromosomes. Appropriate genetic schemes are followed to obtain balanced stocks of entire treated genomes. Each chromosome of each genome is observed for visibles, lethals, detrimental and sterility factors. Tests are made for translocations involving any combination of chromosomes. All chromosomes of each genome are examined cytologically for possible deficiencies, inversions, transpositions, etc. and to determine the break points of the translocations. It is believed that a study such as this will give us a far better idea of the overall magnitude of radiation-induced genetic damage and a better insight into the nature of this damage, especially the interrelationships between the different kinds of genetic alterations, than has heretofore been possible with studies of selected types of damage in selected chromosomes or loci.

Introduction

The scientific background for this project and the research plan have been discussed in the original contract request and in the proposal for renewal, which accompanies this report. This information will therefore not be repeated here. The work has been carried out almost exactly according to the original plan with only minor modifications made in the genetic scheme. The exact scheme used is that which is described in the request for renewal.

The aim for this year has been to obtain data for 2000r of X-rays delivered to mature spermatozoa, data from 4000r having been obtained earlier.

It should be pointed out that although the contract was ac-

tivated November 1, 1967, work could not be started until December when the Co-Principal Investigator assumed her duties at the University of Wisconsin. Some time had to be spent acclimating and expanding stocks and training assistants, so that actually at this writing (July 28), less than 6 months have been spent collecting data.

Results

Five irradiations have been carried out, but one was discarded. (When too many F₁ females fail to produce stocks, the sampling of irradiated genomes is considered as probably biased in favor of less damaged genomes, and the entire irradiation is discarded.) The four successful irradiations have yielded genomes which are in various stages of analysis. Some are already completely studied, many are being studied and some (those from the last irradiation) are still in the process of being "saved", if possible. In fact, it is still not known whether this irradiation will pass the test referred to above. The status of genome collecting is as follows:

	No. F ₁ females mated	No. females died, no usable prog.	No. females sterile	Females weakly fertile; stock not obtained	Partial genomes saved	Whole genomes saved
<u>IRRADIATION</u>						
1	25	0	0	0	2	23
2	31	1	2	0	0	28
3	50	2	3	2	2	41
5	66	?	?	?	?	?

There is little object in describing in any detail the genetic damage found in the few (62) genomes of this series which have been completely analyzed, since this amount of data has little meaning. It might just be mentioned that 43.5% of these genomes have been found to be damaged (as compared with 63.2% with 4000r) and the average number of damaged sites per genome stands at .84 (as compared to 1.1 with 4000r). Thirteen chromosome rearrangements, 31 recessive lethals (17 of them associated with rearrangements) and 7 visibles have been studied so far.

In addition to experimental work, considerable time has been spent in re-checking the data from the 4000r series and preparing the tables for presentation at meetings and for publications. Copies of the tables are included in this report.

Activities Coincident to Main Project

The genetic and cytological set-up for the total genetic damage project has proved of great use to other projects going on in the laboratory. The several special stocks used in the main project plus the possibility for accurate salivary chromosome analysis have been especially useful in solving or confirming some perplexing and interesting cases (e.g. a case of translocation mosaicism). The presence of the Co-Principal Investigator and J.L. Valencia has strengthened considerably the on-going experimental program of the laboratory (opinion of Seymour Abrahamson).

Several stocks have been sent to investigators in other laboratories who have special interest in such cases (e.g. sterile Y chromosomes to G. Brosseau and lethals in chromosome 4 to B. Hochman).

Public Presentation of Work

During the past year, the work, or parts of it, has been presented in the following manners:

(1) An abstract (copy enclosed) was sent to the International Genetics Congress, Tokyo, Japan, with the intention of presenting the work in person. This will not be done due to the impossibility of travelling to the Congress, but the abstract will nevertheless be published.

(2) Two notes concerning parts of the work were sent to Drosophila Information Service:

(a) X; autosome and Y; autosome translocations. DIS 43:144

(b) A cytological study of recessive lethals. DIS 43:151

(3) The work was presented orally at the Drosophila Research Conference in Yale, June 1, 1968.