Alexandrov, I.D. Research Institute of Medical Radiology, Obninsk, USSR. Modification of radiation-induced rates of intra- and intergenic changes at the yellow locus of **Drosophila melanogaster** by the genotype, caffeine, actinomycin-D and radiation quality.

As a part of the larger project on radiation genetics of the specific loci, 98 radiation-induced visible yellow mutations have been discovered in different experiments designed for estimating the effects of various biological, chemical and/or physical variables on the relative proportion of intragenic versus intergenic changes induced by the Low- or High-LET radiation at the locus in question. All the yellow mutations have at first been classified by dint of genetical analysis into 3 main and regularly occurring mutant types (Alexandrov 1984): (1) sterile F_1 visibles (SV), (2) transmissible visibles with recessive lethality inseparable from the yellow phenotype (LV), and (3) transmissible and viable in homo- or hemizygote visibles (VV). According to the data obtained, 17 out of 98 mutations scored were fully SV and 18 out of 81 were LV. Polytene chromosome analysis of 58 VV preserved was carried out and the number of VV associated (VV^{ch}) as well as unassociated (VV^{g}) with chromosome alterations was detected (see results in this issue elsewhere, Alexandrov et al.).

Consummation of this research has made it possible now to estimate the relative proportion of intra-locus changes (VV^{g}) versus all intergenic (that is chromosome SV, LV and VV^{ch}) alterations scored as yellow mutations after action of the variables studied (Table 1). As seen, VV^{g} arise nearly as frequent as chromosome changes in the wildtype (D-32, D-18) male germ cells (the post-meiotic stages as a whole)

TABLE 1.

Conditions of experiment (radiation, dose, modifier used, genotype of male treated, No. of F_1 progeny scored	Number of mutations							
		Chromosome changes:						
	VV^{g}	SV	LV	VV^{ch} Deletions	VV^{ch} Inversions	VV^{ch} Translocations	Lost before analysis	Total a.m.f.
1. gamma-rays, 40 Gy, D-32 and D-18, No.= 177716								
	20	8	4	5	4	2		
[a.m.f.] =	[2.8]			[3.2]				[6.0]
2. Caffeine (0.2%) + gamma-rays, 40 Gy, D-32, No.= 46647								
	5	1	2	2	1		1	
[a.m.f.] =	[2.7]			[3.2]				[6.4]
3. Actinomycin-D [100µg/ml) + gamma-rays, 40 Gy, D-32, No.= 24508								
	0	2	5	4	1		1	
[a.m.f.] =	[0.0]			[12.2]				[13.2]
4. gamma-rays, 40 Gy c(3)G, No.= 56109								
	1	3	5	3		1	3	
[a.m.f.] =	[0.42]			[5.3]				[7.1]
5. 0.35-0.85 MeV fission neutrons, 10 Gy D-32, No.= 51078								
	1.9	3	1	3		1		
[a.m.f.] =	[1.9]			[15.7]				[17.6]
6. ^{252}Cf, 14 Gy D-32, No.= 14682								
	3		1					
[a.m.f.] =	[14.6]			[4.8]				[19.4]
7. 0.85 MeV fission neutron, 10 Gy + gamma-rays, 10 Gy, D-32, No.= 6814								
	1							
[a.m.f.] =	[7.3]							

a.m.f. = Average mutation frequency, locus/r x 10^{-8}.

after gamma-irradiation. Pre-treatment of the D-32 males with caffeine does not modify this picture. However, pre-treatment with actinomycin-D (other things being equal) significantly enhances the occurring of the chromosome yellow mutations and reduces the yield of the gene ones. It would appear that the transformation of the pre-mutational lesions into chromosomal damages and less effective repair of the latter have both simultaneously taken place. These taken together (our own data and the well-known fact that actinomycin-D is bound with GC-repeats of DNA) argue that the chromosome changes, except for VV^g, are initiated by the damages of the repetitive DNA sequences surrounding and/or interspersing the functional genetic unit. Therefore, as it follows from our own experimental data with neutrons (see Table), the quality (mode and perhaps density) of initial lesions predetermines the occurrence of rearrangements also. Thus both factors (i.e., the feature of the initial lesions determined by the radiation quality and the nature of the primarily damaged DNA sequences) appear to be decisive in the processing of the radiation-induced chromosome changes of all kinds.

However, the modifying effect of some other variables studied prove to be new and unpredictable. In particular, the combined irradiation by neutrons and gamma-rays (consecutive or simultaneous in the case of ^{252}Cf) increases the yield of VV^g, but not a chromosome alteration. On the other hand, in the gamma-irradiated c(3)G post-meiotic male germ cells (repair-deficient mutant as proposed by Watson 1972), there was a very marked decrease in the frequency of the VV^g in comparison with that in the gamma-irradiated wild-type germ cells.

One obvious question that needs to be answered is whether these variatioins in the specific-locus radiomutability are conditioned by the variables as such or are due to the feature of the locus studied. To answer this question, the spectrum and frequency of visibles for another loci will need to be studied under the same experimental conditions. Such genetical and cytogenetical analysis of the white, black and cinnabar mutations scored simultaneously with yellow ones is in progress now.

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Studies on bristle number in hybrids between strains of **D.capricorni** from Brazil.

Drosophila capricorni is related to the "willistoni" species group but distinguishable from each other in externally visible characters (Dobzhansky 1951). It usually prefers cooler and humid regions. In Brasil, it extends from northern part to the southern most state. It has rarely been found in the summer while it occurs in abundance during the winter season (pers. comm. from Prof. A.R. Cordeiro), and was confirmed partly by our data.

The object of the present research work was to examine the variance of bristle number in parental, F_1's and F_2 classes. For this purpose, several strains of **D.capricorni** were collected in July 1978 and February 1979 from Itatiaia (Resende, RJ), and were maintained in the laboratory as isofemale lines. A total of 13 strains (six from July 1978 and seven from the year 1979; these lines were maintained at 18°C for 540 and 980 days, respectively, before the commencement of the investigation) were utilized for the research work. Crosses in various combinations between strains (within and between the year of collection) were made to yield F_1 and F_2 classes. A total of 60 parental and 60 F_1's; 60 parental and 60 F_2 classes were analyzed at each of the two temperatures: 18° and 25°C. The parental and F_1's were placed simultaneously at each temperature, using 50 eggs for each of the five or more replicates. Similar procedure was followed for the parental and F_2 classes. The bristle number on 4th and 5th sternites, and the left and right esternopleurals were counted on the same individual in both sexes for each of the parental, F_1 and F_2 classes. In general, 8-10 males and 8-10 females from each of the three to six replicates for each class were examined. (However, there were cases where the sample size was very small which did not alter the final results.) The variance of the difference in bristle number between 4th and 5th sternites, and between left-right esternopleurals was computed. It was observed that the F_1's or F_2's had either equal, greater or smaller value of the variance when compared with their parental classes. However, in general, no significant difference in variance between parental and F_1's, and between parental and F_2's was observed for each sex at each temperature. Thus, these results indicated that the F_1's and F_2's were developmentally as buffered (stable/homeostatic) as their parental classes for the number of bristles examined even though the strains utilized in this experiment were maintained for the two different periods.