Chistyakov, V. A. and I. D. Alexandrov. Research Institute of Medical Radiology, Academy of Medical Sciences of USSR, Obninsk, 249020, USSR. "Sectoral" and "salt-and-pepper" eye mosaicism induced by potential and obvious mutagens/carcinogens in white mutants of D. melanogaster.

Spontaneous or induced genetic reversions w → w^+ in cells of developing eye discs of Drosophila w mutants may obviously result in single pigmented spots of the "sectoral" type, if the genetic events in question take place in young larvae, or "salt-and-pepper" type, if this occurs at a very late stage of fly development (Becker 1966). It is significant that the latter is also typical for rare events of spontaneous intragenic recombination between w heteroalleles resulting in single and small pigmented spots with accidental location on the eye surface (Stern 1969). It is just the phenotype of those spots which are regularly induced by treatment of white mutant larvae with mutagen 1,4-bis-diasoacetyl butane (DAB) (Alexandrov 1982). In this connection DAB-induced spots suggest the phenotypic reflection of a rare w → w^+ genetic reversion.

However, this assumption was not confirmed by the data of EM analysis of DAB-induced spots (Ankina and Alexandrov, elsewhere in this issue) which have been proved to be eye morphosis (mosaics of the DAB type) with specific malformations of the ommatidia ultrastructures. The "sectoral" or "salt-and-pepper" genetic mosaics were never found among 14,918 eyes of DAB-treated flies from 56 different w lines studied. The screening confirmed the first observations that DAB-induced morphosis is somewhat controlled by a genotype as w mutation of itself, and is more often observed in males in comparison with females (average frequencies 1.9% and 0.84%, respectively, for "sensitive" lines on the whole).

The lack of DAB-induced true reversions may be attributed, firstly, to a rarity of such genetic events or, secondly, to unusual resistance of the somatic cell genome to any genetic changes induced by DAB--unlike the germ cells, which have been proved to be highly susceptible to the mutagen in question. For example, the frequency of sex-linked recessive lethal mutations in DAB-treated male larvae (25/894 = 2.79%) is to the extent of 17 times higher than in non-treated larvae (3/1775 = 0.16%).

Table 1. The frequency of mosaic eyes with DAB-type spots and "sectoral" single or "twin" spots in different w mutants of D. melanogaster developed on media with DAB, DDDTDP, EMS or MMS.

Mutagens/ carcinogens (conc.)	The w mutants											
	♀♀ w^{66g}/w^{66g}		♂♂ w^{66g}/Y		♀♀ w^{66g}/w^{co}				♂♂ w^{co}/Y			
	n^D/N*	%**	n^D/N	%	n^D/N	%	n^G/N	%	n^D/N	%	n^G/N	%
DAB (5 mg/ vial)	13a 1b 3c 1714	0.99	9a 2b 4c 1168	1.28	0 450	0.0	0 450	0.0	0 428	0.0	0 428	0.0
DDDTDP (0.5 mg/vial)	0 1584	0.0	0 1584	0.0	0 1076	0.0	0 1076	0.0	0 1044	0.0	0 1044	0.0
0.24% EMS (.03 ml/ vial)	2a 2b 0c 580	0.7	4a 2b 0c 620	0.9	1b 3c 330	1.2	16s 1t 330	4.8 0.3	1a 0b 0c 132	0.7	2s 0t 132	1.5 0.0
0.1% MMS (0.3 ml/ vial)	31a 0b 0c 450	6.9	3a 0b 0c 234	1.3	75a 0b 0c 440	17.0	7s 3t 440	1.6 0.7	20a 0b 0c 144	13.9	1s 0t 144	0.7 0.0
Control	0 1532	0.0	0 1668	0.0	0 712	0.0	0 712	0.0	0 668	0.0	0 668	0.0

n^D = number of eyes with DAB-type spots: a, 1-2 facets; b, 3-4 facets; c, more than 5 facets.
n^G = number of eyes with "sectoral" spots: s, single spots; t, twin spots.
*Number of eyes examined.
**Frequency of mosaic eyes among all eyes scored.

To test the second assumption and, also, the question of whether a positive correlation between the morphogenic and genetic properties in potential and obvious mutagens/carcinogens exists, comparative studies were carried out on the induction of eye DAB-type morphosis, reversions, and mitotic recombination by DAB (obvious mutagen and potential carcinogen), DDDTDP (potential mutagen/carcinogen, Alexandrov 1982), MMS and EMS (obvious mutagens/carcinogens) in cells of developing eye discs of w^{66g}/w^{66g} or w^{66g}/w^{co} females and w^{66g}/Y or w^{co}/Y males. w^{66g} has been proved to be a point mutation located on the right end of a genetic map of the locus in question.

Aqueous solutions of agents tested (see Table 1 for concentrations) were supplemented to media with mutant first-instar larvae. After eclosion, the eyes of imagoes were scored for the presence either of colored single spots (morphosis of DAB type and reversions of "sectoral" or "salt-and-pepper" types in all mutants studied) or characteristic "twin" spots (somatic recombination in w^{66g}/w^{co} females only) under a dissection microscope (25X).

The results of experiments performed are presented in Table 1, and merit the following conclusions. First, no eye spots were ever recovered in the DDDTDP series, or in the controls. Second, as had been observed earlier, DAB produces a characteristic eye morphosis in colorless w^{66g} mutants but not in colored w^{66g}/w^{co} females or w^{co}/Y males. It is also important that DAB is inefficient in producing mitotic recombination or other genetic changes (namely, deletions or point mutations at the w^{co} locus) in cells of the eye anlage. Therefore, a genome of Drosophila somatic cells at any rate studied appear to be highly resistant to the genetic action of DAB. Third, no somatic reversions $w \rightarrow w^{+}$ with the "sectoral" or "salt-and-pepper" phenotype in EMS- or MMS-treated flies were found, although in the germ cells EMS, for example, has been reported to efficiently induce reversions of some white alleles (Banerjee et al. 1978). Further, both mutagens/carcinogens are active inductors of DAB-type eye mosaicism in all w mutants studied. The marked activity of these agents in inducing eye morphosis correlates well with their recombinagenic ("twin" spots in w^{66g}/w^{co} females) and mutagenic (single "sectoral" spots in w^{66g}/w^{co} females and w^{co}/Y males) properties. Therefore, if the correlation in question is intrinsic to other mutagens/carcinogens, the test on induction of DAB-type eye spots in certain w mutants of D. melanogaster may turn out to be a rapid and economical test to detect potential carcinogenic agents.

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References: Alexandrov, I.D. 1982, DIS 58:10-12; Banerjee, J. et al. 1978, Mutation Research 50:309-315; Becker, H.J. 1966, Current Topics in Developm. Biol. Vol. 1, NY-London, Acad. Press, 155-171; Stern, C. 1969, Genetics 62:573-581.

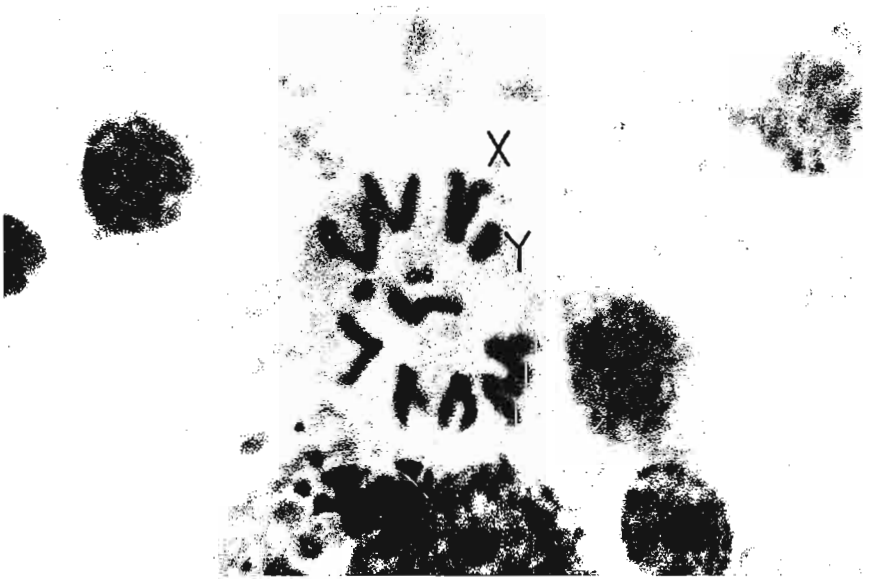

Fig. 1. Karyotype of male D. circumdata

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D. circumdata (Duda 1926) is a member of the quadrilineata subgroup of the immigrans group of species (Wilson et al. 1969). Both sexes possess dark longitudinal stripes on the frons and thorax and only two rows of achrostichal hairs. During a collecting trip to Templer Park just outside Kuala Lumpur in June 1982, numerous male and female adult flies were observed resting on fallen leaves and feeding on rotting fruit of Citrus