

(a) and the final levels (after the increase) with the control final level (after the decrease) (b). Comparison is made for each kind of aberration. Minutes have been separately classified, the major part of it consisting probably in 2 hit aberrations. In the control series all kinds of aberrations decrease. This decrease is higher for exchanges which confirms previous findings¹.

With all chelating agents investigated the ratios are significantly increased for all kinds of aberrations (b). The slight exception noted after EDTA for breaks was probably due to some sample error. Compared with the control, the absolute increase for the total aberrations is ordered: Cupferron, EDTA, 8-hydroxyquinoline, 2,2'-dipyridyl, diethylthiocarbamate.

Discussion and conclusions. The fractionation effect was clearly suppressed by all chelating agents, the efficiency of which being different for each kind of agent, which may depend on the stability constant of the chelating complexes. The present finding is a strong indication that ionic bonds are involved in the first rejoining processes of broken chromosomes suggesting a direct effect at the chromosome level. However, the protective effect after unfractionated doses or doses separated by small intervals could arise from an indirect mechanism as in mammals. New experiments designed to see the part

played by different ions, as well as induced specific chromosome modifications, are in progress¹³.

Résumé. Des graines sèches de *Nigella damascena* ont été traitées par les agents de chélation suivants: l'EDTA, le 2,2'-dipyridyl, le Cupferron, la 8-hydroxyquinoléne et le diéthylthiocarbamate avant d'être irradiées par les rayons γ du ⁶⁰Co à des doses fractionnées (2 × 2 krad) séparées par des intervalles de 0 à 5 min. On a constaté une suppression de l'effet de fractionnement et une augmentation absolue des fréquences de tous les types d'aberrations des chromosomes. Par contre, pour des intervalles courts ou nuls, un effet radioprotecteur est observé par rapport au témoin.

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A Correlation Between the Ability to Withstand High Temperatures and Radioresistance in *Drosophila melanogaster*

Single inseminated founder females of *D. melanogaster* collected in the wild have been shown to lead to strains which differ for several quantitative traits, such as scutellar and sternopleural chaeta numbers^{1,2}, mating speed and duration of copulation³, ability to withstand temperature shocks⁴, and resistance to irradiation with Co⁶⁰ γ -rays⁵. As argued in these publications, this is indirect evidence that the wild populations are polymorphic for genes (or polygenes) controlling these traits⁶. The polymorphism for scutellar chaeta number has been exploited by HOSGOOD, MACBEAN and PARSONS⁷ who found that when directional selection for high chaeta number was based on those strains which had a high scutellar chaeta number, extremely rapid responses were obtained.

In this paper, we discuss the ability of populations to withstand high temperatures in relation to their level of radioresistance to Co⁶⁰ γ -rays. Referring first to the ability to withstand high temperatures, newly hatched larvae were placed into vials for each of 18 strains all derived from single inseminated females collected at Leslie Manor (Victoria)¹⁻⁵, and the number of adults that emerged at the extreme temperature of 30.5°C was scored. This is a temperature at which it is difficult to culture *Drosophila*. The experiment was done twice, 2 generations apart, and the percentages that did not emerge are given in Table I. The data in Table I were transformed using the angular transformation to avoid a correlation between the raw percentages and their variances. The correlation coefficient between the angular values for the 18 strains in Table I came to 0.690, which is significantly > 0 at $P \approx 0.001$ (17 degrees of freedom). Thus, even though fewer flies emerged in the first than in the second experiment, there is a high degree of repeatability between experiments in spite of limited data. It is relevant that strain 2 is very sensitive to a

Table I. Percentage of flies that did not emerge as adults when grown at 30.5°C

Strain	First experiment ^a	Second experiment ^b
1	92.5	32
2	89.5	64
3	53	12
20	57.5	12
21	48	28
22	68	15
23	88.5	28
24	68.5	16
25	64	17
26	74.5	17
27	72.5	33
28	61.5	32
29	54	7
30	64.5	18
31	86	37
32	88.5	32
33	77.5	30
34	75.5	24

^a Percentages based on 4 replicates of 50 larvae. ^b Percentages based on 4 replicates of 25 larvae.

¹ P. A. PARSONS and S. M. W. HOSGOOD, *Genetica* 38, 328 (1967).

² P. A. PARSONS, *Aust. J. biol. Sci.* 27, 297 (1968).

³ S. M. W. HOSGOOD and P. A. PARSONS, *Aust. J. biol. Sci.* 20, 1193 (1967).

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⁵ P. A. PARSONS, I. T. MACBEAN and B. T. O. LEE, *Genetics* 67, 211 (1969).

⁶ P. A. PARSONS, I. T. MACBEAN and B. T. O. LEE, *Molec. gen. Genet.* 99, 165 (1965).

⁷ S. M. W. HOSGOOD, I. T. MACBEAN and P. A. PARSONS, *Molec. gen. Genet.* 107, 217 (1968).

temperature shock of 33.5°C applied to adult flies for 24 h⁴, and shows on average the worst emergence for larvae grown at 30.5°C. On the other hand, strains 1 and 3 are more resistant to the temperature shock of 33.5°C, and also being grown from larvae at 30.5°C. Thus, this seems to suggest the possibility that genes controlling temperature sensitivity act in a similar way at different stages in the life cycle of *Drosophila*.

Sensitivity to irradiation by Co⁶⁰ γ -rays was assessed by exposing virgin flies in batches of 50 per sex to doses of Co⁶⁰ γ -rays of 90,000 and 110,000 rads at an intensity of 486,000 rads per hour⁵. The percentage mortalities at 3 days following exposure are given in Table II for the 18 strains. There is a significant difference between strains showing that the base population is polymorphic for genes controlling this trait⁵.

Two of the most sensitive strains were 2 and 23, and 2 of the most resistant were 3 and 29. Referring to Table I, there is a correspondence in that strains 2 and 23 are

Table II. Percentage mortalities of 50 flies at 3 days following irradiation with Co⁶⁰ γ -rays (PARSONS, MACBEAN and LEE, 1969)

Strain	90,000 r		110,000 r	
	♀	♂	♀	♂
1	2	0	54	100
2	4	58	100	100
3	0	0	6	44
20	4	8	46	72
21	2	12	36	48
22	0	0	22	100
23	22	46	60	100
24	8	16	60	100
25	0	2	34	72
26	8	12	8	38
27	18	24	24	66
28	0	10	10	68
29	0	2	0	30
30	10	2	4	72
31	4	12	56	64
32	0	2	94	88
33	0	0	72	74
34	2	2	72	80

temperature sensitive, and 3 and 29 are resistant. After summing the angular values of the percentages given in each of Tables I, and II, a correlation coefficient was computed between strains for Tables I, and II. This came to 0.776 which differs significantly from 0 at the 0.001 level of probability (17 degrees of freedom). This suggests the possibility of an association between sensitivity to high temperatures and irradiation with Co⁶⁰ γ -rays. There is some limited published evidence suggesting this, namely OGAKI and NAKASHIMA-TANAKA's⁸ observation that 2 strains of *D. melanogaster* were found to be both radio-sensitive and temperature-sensitive, and 3 strains were resistant to both temperature and radiation.

At this stage, it is difficult to interpret the correlation between resistance to temperature and irradiation. However, studies in mice on chromosome aberrations in liver cells have shown a correlation between the rate at which chromosome aberrations accumulate in animal cells and the life span of animals⁹. Thus short-lived animals may die because their chromosome structure is unstable, and so they develop degenerative diseases sooner. Similarly those strains sensitive to temperature and γ -rays may be more susceptible to chromosome upsets as a result of the environmental stress imposed, than those resistant to temperature and γ -rays, but more work is needed on this point¹⁰.

Résumé. Dans une étude sur 18 races de *D. melanogaster* une corrélation a été trouvée entre les facultés de résistance aux températures élevées et à l'irradiation γ du Co⁶⁰.

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⁸ M. OGAKI and E. NAKASHIMA-TANAKA, Mutation Res. 3, 438 (1966).

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Melanocyte-Stimulating Hormone and Learned Appetitive Behavior

Melanocyte-stimulating hormone (MSH), secreted by the pituitary gland, is known to produce pigmentary changes in amphibians. Its function in mammals is not known, but the possible extra-pigmentary roles of MSH have been recently reviewed¹.

No studies have been reported concerning the effects of MSH on learned appetitive behavioral tasks, although the maintenance of a conditioned avoidance response has been observed²⁻⁵. The appetitive task in the present study was an instrumental response made to obtain the positive reward of food. Accordingly, acquisition and extinction of the learned appetitive response for food were evaluated after the administration of MSH to rats.

Material and methods. 45 adult male albino rats were matched for weight (approximately 170 g) and then randomly assigned to one of 9 groups. 4 groups of rats

received 10 μ g of MSH i.p. for 5 days. The 4 preparations employed were highly purified bovine α and β MSH^{6,7}

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