McCrady, W. B. and R. L. Sulerud, Arlington State College, Texas and Augsburg College. Additional factors which affect delayed-recovery from CO_2 in D. melanogaster.

In continuing studies of the phenomenon of delayed-recovery from CO_2 exposure in D. melanogaster, certain factors in addition to those reported earlier (Gen. 50:509-526) have been found to influence the recovery activity of TDR (Texas Delayed Recovery) flies following CO_2 exposure. Two of these factors are discussed below.

1. Genetic background: Differences in recovery activity have been observed in three TDR strains. Since controlling the age and the condition of the flies does not diminish the distinctness, the differences have been tentatively interpreted as being primarily due to the existence of different genetic modifiers of delayed-recovery in the strains indicated. The strains studied are all homozygous for Dly, the semidominant gene primarily responsible for delayed-recovery, but consistent variation between them has been found in recovery time and survival percentage following a standard CO_2 test (15 minute exposure to pure CO_2 at 14°C). An example of the variation found is given in Table 1. The strain designated TDR-BC_3 is least affected by CO_2 exposure. (This strain was developed by crossing heterozygous delayed-recovery progeny of the third backcross generation of crosses involving the mating of CO_2-resistant Oregon-R females and TDR males.) In the test shown, most (95%) TDR-BC_3 flies recovered, with all recovery taking place within an hour after testing. TDR-orange, an orange-eyed TDR mutant, is the "strongest" of the three strains. In this case recovery of survivors is seen to have required more than an hour, and only 61% survival occurred. (In other studies survival was often less than 50% for this strain.) Strain TDR-1a (derived from a female isolated from one of the original substrains established) is clearly intermediate between the other two as to recovery time and percentage of survivors. Other CO_2 tests of these strains have revealed similar differences between them, notwithstanding the fact that variation within the strains also exists. Studies have been initiated to determine the effects of selection on the recovery ability of these strains.

Table 1. Recovery activity of three TDR strains following CO_2 exposure for 15 minutes at 14°C.

		Percent apparently recovered after:						
Strain	n	15 min.	30 min.	1 hr.	2 hr.	4 hr.	8 hr.	16 hr.
TDR-orange	140	0	0	0	31.4	65.0	61.4	61.4
TDR-1a	185	0	3.2	15.7	49.7	70.3	86.5	87.6
TDR-BC_3	62	3.2	37.1	100	100	100	95.2	95.2

2. Fly age: Members of the three strains indicated above were aged for varying periods and then exposed to CO_2 for 10 minutes at 10°C. The results are given as follows:

Table 2. Recovery activity of TDR flies of different ages following CO_2 exposure for 10 minutes at 10°C

Strain		Percent apparently recovered after:							
and Age	n	15 min.	30 min.	45 min.	1 hr.	1 1/2 hr.	2 hr.	2 1/2 hr.	3 hr.
TDR-orange									
1/2-1 1/2 days	24	0	0	0	8.3	62.5	91.6	91.6	91.6
1 1/2-2 1/2 days	20	0	0	0	0	40.0	90.0	95.0	85.0
2 1/2-3 1/2 days	28	0	0	0	0	21.4	60.7	78.5	75.0
3 1/2-4 1/2 days	24	0	0	0	0	4.1	25.0	45.8	58.3
4 1/2-5 1/2 days	24	0	0	0	0	4.1	25.0	54.1	62.5

TDR-1a									
1/2-1 1/2 days	27	3.7	29.6	33.3	59.2	96.2	96.2	96.2	96.2
1 1/2-2 1/2 days	36	0	0	5.5	33.3	83.3	88.8	100	100
2 1/2-3 1/2 days	43	0	0	6.9	27.9	69.7	97.6	100	100
3 1/2-4 1/2 days	28	0	0	7.1	28.5	57.1	96.4	96.4	96.4
4 1/2-5 1/2 days	28	0	7.1	17.8	28.5	64.2	60.7	71.4	75.0
TDR-BC_3									
1/2-1 1/2 days	5	0	40.0	100	100	100	100	100	100
1 1/2-2 1/2 days	6	0	33.3	100	100	100	100	100	100
2 1/2-3 1/2 days	15	0	13.4	80	100	100	100	100	100
3 1/2-4 1/2 days	21	0	4.7	66.6	85.7	95.2	100	100	100
4 1/2-5 1/2 days	11	0	18.1	100	100	100	100	100	100

In keeping with what has been reported earlier, the recovery times are shorter and the recovery percentages are higher than would have been the case had testing been conducted under standard conditions (14°C for 15 minutes). It is also seen that TDR-orange was influenced the most by the test and TDR-BC_3 the least, as was expected. But in addition, the older flies of each strain were, in general, more susceptible to CO_2 treatment than younger flies. This is reflected in TDR-BC_3 by the somewhat longer recovery time for the older flies (the 4 1/2-5 1/2 day old flies are an exception to this rule). For the other two strains, not only was recovery accomplished more slowly by older flies but survival decreased appreciably with age. After an age of four or five days, the recovery time and recovery percentage stabilizes, so that flies older than this recover in a similar manner until the onset of senility.

Bairati, A. Jr. and B. Baccetti. University of Milan and Entomologia Agraria Firenze, Italy. Observations on the ultrastructure of male germinal cells in the $X^{Lc}Y^{S}$ mutant of Drosophila melanogaster Meig.

We have subjected the testes of the $X^{Lc}Y^{S}$ mutant of Drosophila melanogaster to an electron microscope investigation with the techniques we use for studying normal spermiogenesis in the same species (Baccetti and Bairati, 1964 Redia 49: 1-29) with the object of obtaining comparative data on the ultrastructure of the flagellum in sperm that other workers consider to be immobile. The first conclusion we reached is that the majority of the sperm do not attain maturity, although the spermatid may undergo considerable lengthening and almost complete maturation, evinced by the development of the nucleus, of the mitochondrial derivatives and of the axial filament complex of the flagellum. Indeed all the cysts we examined presented degenerative features and no isolated mature sperm were observed. In the spermatids the mitochondrial derivatives presented several types of deviation from the norm and only rarely did they develop as in normal males. The alterations we observed were as follows: the presence of an electron opaque fiber in both of the mitochondrial derivatives that lie alongside the flagellum instead of in one of them only; complete absence of mitochondrial derivatives; separation of one or both derivatives from the axial filament; complete absence of the osmiophilic fiber inside both mitochondrial derivatives; vesicular swelling of one or both mitochondrial derivatives; the presence of a third element of the mitochondrial derivatives. These observations partially confirm the results of Shen (Zeit.f.Zellforsch. 1932, 15:547-580) and of Brosseau (Genetics 1960, 45: 257-274) regarding the sterility of males of this mutant, due to the absence of mature sperm through degeneration of the sperm and not because the mature sperm are immobile, but, owing to the greater resolving power of the electron microscope, one can detect abnormal spermiogenesis; since the alterations visible in the spermatids affect all the cells of the cyst, they probably begin at the premeiotic stage. The absence of a segment of the Y chromosome affects spermiogenesis by influencing the development of the mitochondrial derivatives.