Herforth, R. and N. Westphal. University of Nebraska, Lincoln. Observations on the frequency of carbon dioxide sensitivity in a natural population of Drosophilid flies.

Drosophilids were collected daily at a single site in Lincoln, Nebraska, from June to October, 1965. Many of these wild-caught flies were tested for sensitivity to carbon dioxide by submitting them to the standard treatment of 15 minutes of pure CO_2 at 14°C. Those not awake 15 minutes after removal from CO_2 were considered sensitive.

Sensitivity was found regularly only in D. melanogaster, D. affinis males, and D. affinis subgroup females. The monthly frequency of sensitives in each of these groups is given in Table 1.

Table 1. Monthly frequency of CO_2 sensitivity in D. melanogaster, D. affinis males and D. affinis subgroup females.

	D. melanogaster		D. affinis males		D. affinis subgroup females	
Month	S/N	%S	S/N	%S	S/N	%S
June	3/85	3.5	32/126	25.4	9/44	20.5
July	12/829	1.4	91/477	19.1	39/184	21.2
August	31/1735	1.7	1/19	5.3	1/7	14.3
September	38/1738	2.2	2/3	66.7	0/6	0
October	17/1083	1.6				
Totals	101/5470	1.8	126/625	20.2	49/241	20.2

One of 44 melanica and 2 of 223 Aulacigaster leucopeza tested did not recover. An attempt to induce sensitivity in melanogaster by inoculation of an extract from the two sensitive Aulacigaster was unsuccessful. Small numbers of other Drosophila species were tested, but no sensitivity was observed. These species, followed by the number of flies tested, were as follows: putrida (25), buskii (18), robusta (18), algonquin males (12), hydei (12), quinaria (3), macrospina (3), transversa (1), and funebris (1).

The percentages of sensitivity obtained for the entire five month period agree well with those obtained by D. L. Williamson (1959, 1961). He found that 1.6% of 6301 melanogaster collected in Lincoln during August and September of 1957 were CO_2 sensitive. Percentages of sensitive affinis collected in Lincoln were 24% during June-August, 1957; 25% in June, 1958; and 19% in June, 1959. Apparently the frequency of sensitivity in this population has remained fairly stable, 1 to 2% in melanogaster and between 19 and 25% in affinis.

It also appears that when large samples of flies were tested over a long period of time, as in melanogaster from July to October, very little seasonal variation occurred. This may indicate that the virus present in these flies is temperature-resistant, since a temperature of 30°C results in the apparent destruction of temperature-sensitive viral particles in the oogonia of sensitive females (L'Héritier, 1958). Temperatures in Lincoln surpass 30°C quite frequently during July and August.

Six melanogaster, 39 affinis males, and 15 affinis subgroup females classified as sensitive subsequently recovered from the exposure to CO_2. Four affinis females which recovered 30 minutes to one hour after exposure were isolated in vials containing food and allowed to lay eggs. The progeny of these were collected and tested with CO_2. Three of these females produced both resistant and sensitive offspring, indicating that they were probably nonstabilized. The offspring from the other female exhibited symptoms similar to those seen in D. melanogaster flies having the gene Dly for delayed recovery to CO_2 (McCrady and Sulerud, 1964). These included a recovery time of 1/2 to 2 hours when tested at 14°C, uncoordinated movements during and after the recovery period, and very slow recovery or lethality when tested at 30°C. A strain of these flies has been established, and the delayed recovery response has been expressed in all flies tested through three generations. Crosses are underway to determine whether this characteristic in D. affinis is also due to a chromosomal factor.

References: L'Héritier, Ph., 1958. Adv. Virus Res. 5:195.
McCrady, W. B. and Sulerud, R. L., 1964. Genetics 50:509.
Williamson, D. L., 1959. Ph.D. Thesis, Univ. of Nebraska.
_____ 1961. Genetics 46:1053.