Ransom, R. Open University, Milton Keynes, U.K. Investigation of temperature sensitivity in three eye mutations.

Milani (1946) has previously reported that the D. melanogaster mutation sine oculis is temperature sensitive, the eyeless effect being enhanced when flies are cultured over 25°C and lethality is reached at 30°C. Because a deeper analysis of the time span of temperature sensitivity may help to pinpoint the time of gene action, a series of temperature shift experiments were carried out. Prepupal growth was split into three stages, embryonic, 1st-2nd larval instars and 3rd larval instar development. Flies were reared either at 22°C, 29°C or with shifts between these two temperatures at the onset or close of the three stages studied.

Both 22° and 29° growth periods were "corrected" to standard 25° growth periods. This was done because the prepupal growth period took about 1.2X and 0.8X that of 25° growth respectively. Shift times were therefore calculated using these multiplication factors. The results may be seen in Table 1. The effect of embryonic temperature on both the proportion of flies with eyes and lethality is low. The effect of larval temperature shifts is more marked with a 35% increase in eye frequency and 37% drop in lethality when larval culture is at 22°C. The reduction in eyelessness may be totally accounted for by passing the third larval instar at 22°C. It has recently been shown by histology and clonal analysis (Ransom 1979) that cell death occurs in the third larval instar of so, thus suggesting that the temperature reduction may lessen cell death. Lethality cannot be narrowed down in this way, both early and late larval culturing at low temperature being necessary to limit lethality.

Experiments using both ey^2 and ey^D failed to show any differences in eye sizes or lethality after culturing at different temperatures. Baron (1935) noted a significant reduction in eye size among ey^2 stocks selected for small eye size over a period of some generations and then cultured at high temperature for various periods. The time of greatest change was observed as 36-60 hours, earlier than the so change reported here.

Table 1. Temperature sensitivity in sine oculis. "High" and "low" refer to the temperatures (29°C, 22°C) at which the periods in the left hand column were passed. EMB = embryonic; L1, L2, L3 = first, second, third larval instars. L = whole larval period. All = 0-120 hours at given temperature. Proportional differences are calculated as the difference between high and low temperature values divided by the average of the two values.

	temperature at given period	proportion of flies with eyes ± se	proportional difference in eye freq high/ low temperatures	lethality ± se	proportional difference in lethality high/ low temperatures
EMB	high	.16 ± .03	0.12	.64 ± .16	0.05
	low	.18 ± .07		.61 ± .02	
L1 + L2	high	.25 ± .03	0.22	.70 ± .20	0.15
	low	.20 ± .11		.60 ± .06	
L3	high	.13 ± .03	0.42	.68 ± .12	0.17
	low	.20 ± .04		.57 ± .06	
L	high	.14 ± .03	0.35	.73 ± .13	0.37
	low	.20 ± .06		.50 ± .09	
All	high	.13 ± .01	0.42	.81 ± .11	0.47
	low	.20 ± .03		.50 ± .08	

This work was performed in the laboratory of Dr. J.A. Campos-Ortega, Institüt für Biologie III, Universität Freiburg, West Germany.

References: Baron, A.L. 1935, J. Exp. Zool. 70:461-490; Milani, R. 1946, Boll. Soc. Ital. Biol. Sper 22:112-113; Ransom, R. 1979, J. Emb. Exp. Morph. in press.