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Botella, L.M., A.Moya and J.L.Mensua. University of Valencia, Espana. Effect of butyrate on the development of D.melanogaster.

In the course of larval competition studies, larval stop in development was detected by Mensua & Moya (1983) by means of the overfeeding technique (Moya & Mensua 1983). In an attempt to find out the possible origin of this stop produced in crowded cultures, some natural waste products were assayed for their ability to reproduce the larval arrest in non-competitive conditions. Urea was first shown to delay larval development (Botella et al. 1983a), and this result was also confirmed for uric acid (main waste product of the Nitrogen metabolism in Insects).

Moreover both urea and uric acid were shown to be able to mimic the larval stop detected in overcrowded conditions (Botella et al. 1983b). Following the series of experiments with products which might reasonably reproduce the above results, to go more deeply into the mechanism of larval stop, Sodium Butyrate was assayed. The effect of Sodium Butyrate was assayed by adding this product in different concentrations (25 mM, 50 mM, 100 mM and 200 mM to Lewis' medium). Seventy larvae of an isogenic Oregon-R strain were seeded in 5 ml. of Lewis' medium (non-crowded cultures). The temperature was kept at 25±1°C. A total of five replicae were made at each dose, and a control of Lewis' medium without Sodium Butyrate was made. Table 1. shows the effects of Sodium Butyrate on survival and development time. As can be seen, there is an increase in development time with the Butyrate concentrations and survival decreases greatly from 0 to 200 mM.

Table 1. Effect of Sodium Butyrate over Mean Survival (S) and Mean Development Time (MDT).

Dose	S	MDT
0 (control)	56.6±2.7	13.51±0.14
25 mM	51.4±1.5	12.50±0.15
50 mM	34.2±4.3	14.75±0.49
100 mM	28.2±2.7	14.34±0.13
200 mM	6.6±1.4	17.21±0.28

Table 2. Mean survival (S) and Mean Development Time (MDT) in inner and outer population throughout overfeedings in crowded conditions (control) and for non-competitive media supplemented with 50 mM and 100 mM of Sodium Butyrate.

Overfeedings	S			MDT					
				Control		50 mM		100 mM	
	Control	50 mM	100 mM	Inner	Outer*	Inner	Outer**	Inner	Outer***
Control 5 ml.	61.8±0.8	54.0±1.4	31.4±2.9	-	13.7±0.1	-	15.4±0.1	-	18.2±0.1
8	61.0±2.2	45.0±5.1	39.8±3.6	14.5±0.5	16.5±0.2	15.2±0.2	15.3±0.1	-	17.9±0.1
10	50.8±4.8	52.8±2.5	27.2±1.0	14.4±0.2	18.4±0.1	14.7±0.1	16.3±0.2	-	18.7±0.1
12	54.5±2.7	51.6±0.4	35.4±1.6	15.2±0.1	20.5±0.1	15.9±0.1	18.1±0.1	16.8±0.3	19.2±0.1
14	36.2±4.2	52.2±1.9	37.6±1.1	15.6±0.5	22.4±0.3	15.7±0.1	21.0±1.0	18.1±0.1	20.9±0.1
16	34.2±2.0	55.6±2.3	29.6±1.1	14.1±0.1	25.0	16.3±0.1	-	18.8±0.1	23.1±0.9
0.5ml Control	19.8±2.2	-	-	17.3±0.2	-	-	-	-	-

* 1=7.97; b=1.05; R^2=0.998. ** a=7.31; b=0.94; R^2=0.970. *** a=12.42; b=0.63; $R^2$0.960.

Once the delayer effect of Butyrate had been shown, the following step was to compare the results of overfeeding experiments in crowded media (70 larvae in 0.5 ml. of Lewis' medium) with those of non-crowded (70 larvae in 5 ml. of Lewis' medium) supplemented with Sodium Butyrate. Only two doses of Butyrate were chosen for this kind of experiment: 50 mM and 100 mM which are those doses judged most suitable for the effect being sought. A total of five replicae were made. Table 2 shows the overfeeding in crowded media which served as control for the overfeeding in non-crowded media supplemented with 50 mM and 100 mM of Sodium Butyrate. The times of overfeedings were 8th, 10th, 12th, 14th and 16th day from the seeding day. In Table 2 larval stop is evident from the regression analysis. As regards total survival, the 50 mM concentration shows better survival than the crowded cultures, the opposite being true for the 100 mM concentrations. The regression of outer mean development over overfeedings shows larval stop in both concentrations, 50 mM and 100 mM, though the development at 50 mM is closer than 100 mM to crowded conditions.

Altogether the results reveal that Sodium Butyrate mimics quite accurately the result obtained in crowded cultures with respect to larval stop, delayed development and survival. Butyrate is known to inhibit cellular deacetylases of histones leading to an active state of chromatin (Weisbrod 1982). Thus, in one way or another the phenomenon of larval stop must be related to the regulation of gene expression, probably in relation to the genes responsbile for Juvenile hormone and Ecdysone production which are controlling all the development.

References: Botella, L.M., A.Moya & J.L.Mensua 1983a, DIS 59:23-24; Botella, L.M., C. Gonzalez & J.L.Mensua 1983b, EDRC, Cambridge; Mensua, J.L. & A.Moya 1983, Heredity 51:347-352; Moya, A. & J.L.Mensua 1983, DIS 59:90-91; Weisbrod, D. 1982, Nature 297:289.

Bouletreau, M., P.Fouillet, E.Wajnberg and G.Prevost. University of Lyon, France.

A parasitic wasp changes genetic equilibrium in D.melanogaster experimental populations.

Parasitism has long been suspected to be involved in genetic equilibrium and polymorphism of natural populations (Day 1974; Clarke 1979; Price 1980). However the lack of experimental evidence, at least for animal populations, makes this hypothesis rather speculative.

We compared the evolution of the allelic frequency at the sepia locus in experimental populations of D.melanogaster either free of parasites, or constantly kept under parasitic pressure by the larval endoparasite Leptopilina boulardi (Nørdlander 1980).

The cage populations were of the overlapping generations type, with a weekly introduction of four cups each containing 25 gm of fresh yeast medium (David & Clavel 1965), and a turnover based on a two weeks periodicity. Wild Drosophila and parasite strains originated from Tunisia. The mutant stock sepia has been kept under laboratory conditions for many generations.

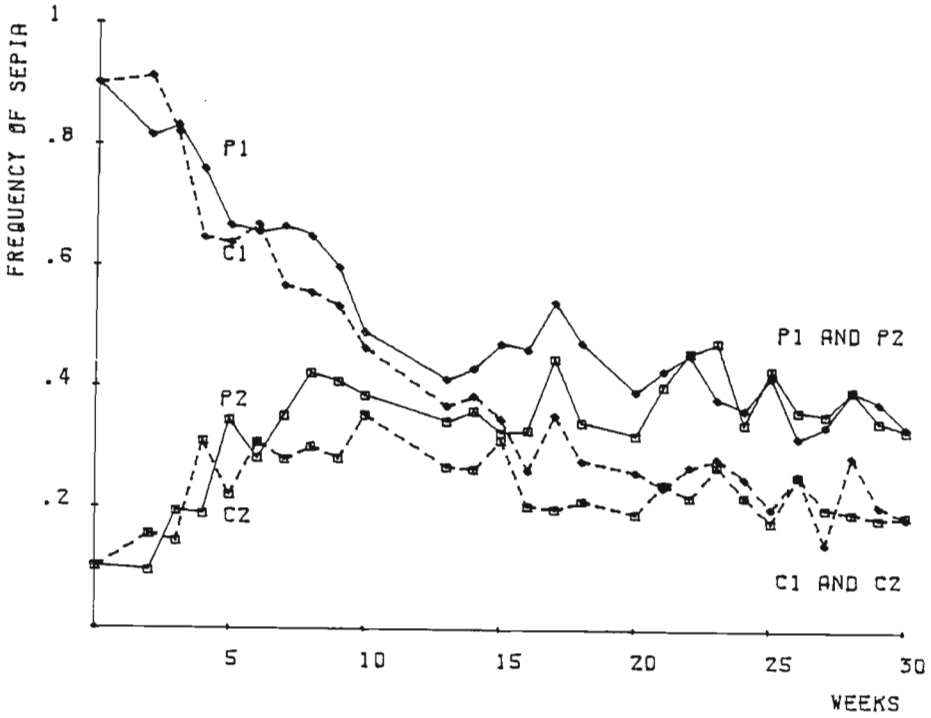

Fig. 1. Allelic frequencies at the sepia locus in control cages (C1 & C2) and in parasitized ones (P1 & P2).