Table I. Sex ratios derived from maternal and paternal infection with the lactate dehydrogenase (LDH) virus

Items	Experimental mice		Control mice
	Dam infected[a]	Sire infected[a]	
Litters	36	54	50
Babies	239	326	310
Weanlings	198	276	270
Infected weanlings (%)	60	0	0
Male: female offspring (number)	111:105[b]	128:168[c]	148:142[d]
Male:female sex ratio (%)	51:49	43:57[e]	51:49

[a] Intraperitoneal injection of 0.10 ml of plasma containing $10^{7.0}$ ID_{50}/ml of LDH virus at 10–19 days before conception. [b] The sex of 23 offspring could not be determined. [c] The sex of 30 offspring could not be determined. [d] The sex of 20 offspring could not be determined. [e] $P < 0.01$.

it was not possible to maintain a constant enzyme elevation by periodic administration of homologous LDH. Accordingly, this finding should be regarded as partial or inconclusive support for the assumption that the level of plasma LDH in the male parent is not a factor in the alteration of the sex ratio[8].

Résumé. On met en évidence le fait que le virus LDH exerce un effet sur la proportion des sexes chez les souris par l'intermédiaire du père. En ce qui concerne le mécanisme impliqué dans ce phénomène, les résultats obtenus jusqu'à présent semblent insuffisants pour permettre une conclusion.

Table II. Sex ratio derived from paternal administration of lactate dehydrogenase (LDH)

Items	Experimental mice[a]	Control mice
Litters	27	20
Babies	175	124
Weanlings	131	108
Male:female offspring (number)	63:77[b]	59:57[c]
Male:female sex ratio (%)	45:55[d]	51:49

[a] Each sire received 5 i.p. injections of homologous mouse LDH (20,000 U/24 h) beginning at 8–12 days before conception. [b] The sex of 35 offspring could not be determined. [c] The sex of 8 offspring could not be determined. [d] $P > 0.10$.

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Effects of Temperature on the Development of Scutellar Bristles

The scutellum of *Drosophila melanogaster* flies usually has 4 macrochaetes, 1 at each of the 2 anterior corners and 2 close to the posterior margin. In flies with more than 4 scutellar bristles the extra bristles can occur at these posterior and anterior sites or on the dorso-lateral margins of the scutellum between the anterior and posterior sites (interstitial bristles)[1].

The number and positions of extra scutellar bristles can be modified by the temperature at which the flies are cultured[2]. Not all stocks of *D. melanogaster* exhibit these temperature effects but when they are present the mean scutellar bristle number is inversely related to the culture temperature. In addition flies cultured at 29 °C often have a higher proportion of posterior bristles and fewer anterior bristles than flies from the same stock cultured at lower temperatures.

The mean scutellar bristle number of a wild-type stock (Athens), maintained at 25 °C was 4.56, 61.0% of the extra bristles were interstitial, 34.7% anterior and 4.3% posterior. Culturing the Athens stock at 20 °C had no effect on the proportion of flies with extra bristles or on the mean bristle number but the proportion of extra anterior bristles increased to 49% (Table I). At 29 °C the Athens stock had a lower mean scutellar bristle number and 25% of the flies had extra bristles, all in posterior positions. 10% of the flies cultured at 29 °C had less than 4 scutellar bristles and without exception the bristles were missing from anterior sites.

Male flies from the Athens stock were crossed to females carrying the second and third chromosome markers *Pm* and *Mé* respectively. The resulting *Pm*/+, *Mé*/+ flies were intermated and their progeny cultured at 20 °C. Male and female progeny of each of the 4 marker genotypes were assayed to determine the effect on scutellar bristle number of Athens second and third chromosomes.

These data (Table II) show that although the mean scutellar bristle number of the Athens stock is the same

Table I. Effect of culture temperature on the scutellar bristle number of the Athens stock

Culture temperature	Joint mean scutellar bristle numbers of females and males.	% flies with extra bristles	% extra bristles at the 3 sites		
			Posterior P	Anterior A	Interstitial I
20 °C	4.5	46.4	–	49.0	51.0
25 °C	4.5	42.3	4.3	34.7	61.0
29 °C	4.3	25.0	100	–	–

[1] A. FRASER, Genetics *48*, 497 (1963).
[2] P. PENNYCUICK and A. FRASER, Aust. J. biol. Sci. *17*, 764 (1964).

at 20 °C as at 25 °C, flies homozygous for Athens third chromosomes and heterozygous for Athens second chromosomes have a higher mean scutellar bristle number at 20 °C than the Athens stock. There is an interaction between second and third chromosomes in the Athens stock at 20 °C reducing the mean scutellar bristle number. Negative interchromosomal interactions affecting scutellar bristle number have previously been described[3,4] and might be expected to be a feature of such a highly canalized character.

In order to investigate a possible developmental basis for this interaction the temperature effective period (TEP) of scutellar bristle formation was examined. For these experiments the egg laying period was restricted to 4 h to reduce variability in larval developmental stages. Eggs from the Athens stock were collected on yeast seeded agar discs which were subsequently placed in $^1/_2$ pint milk bottles with standard culture medium and transferred to the relevant culture environment. 1 ml of a solution of 3 parts ethyl alcohol to 1 part glacial acetic acid was added to the surface of the agar to promote egg laying.

Table II. Effects of Athens second and third chromosomes on scutellar bristle number

	Genotypes			
	Pm Mé / + +	*Pm* ± / + +	± *Mé* / + +	± ± / + +
Mean scutellar bristle number	4.4	5.6	4.3	4.5
% flies with extra bristles	52.2	68.9	23.2	38.3

Table III. Effects of periods at 20 °C and 29 °C on scutellar bristles

Culture temperature during larval and pupal stages				Joint mean scutellar bristle number	% flies with extra bristles	% extra bristles at the 3 sites		
1st instar	2nd instar	3rd instar	Pupal stages			P	A	I
–	20	20	20	4.5	46.4	–	49.0	51.0
–	20	20	–	5.1	66.6	0.6	47.1	52.3
–	–	20	–	5.1	71.2	0.8	29.7	69.5
–	29	29	29	4.3	25.0	100	–	–
–	29	29	–	4.2	15.5	37.3	32.5	30.2
–	–	29	–	4.1	8.0	50.8	11.5	30.7

Culture temperature 25 °C unless indicated otherwise.

Table IV. Effect of culture temperature on scutellar bristle number

Hours at 29 °C after eggs laid before transfer to 20 °C	Joint mean scutellar bristle number	% flies with extra bristles	% extra bristles at the 3 sites		
			P	A	I
48	5.2	75.4	–	38.4	61.8
72	5.2	76.2	–	33.3	66.4
96	5.1	71.3	–	32.4	67.6
120	4.6	43.5	0.8	33.1	66.1
144	4.3	31.9	32.8	25.8	41.4
Until emergence	4.2	12.8	70.0	10.0	20.0

The larvae were allowed to develop at 25 °C for varying periods, related to the larval instars, before being transferred to 20 °C or 29 °C and subsequently transferred back to 25 °C at the dark-eyed pupal stage for the adults to emerge.

Preliminary experiments confirmed CHILD's[5] finding that temperature changes during the first instar of larval development had no effect on scutellar bristle number. However, adults whose third instar larval stage was cultured at 20 °C had the same mean scutellar bristle numbers as flies whose second and third instar larvae had been cultured at 20 °C (Table III). These mean scutellar bristle numbers were higher than those of flies that completed development at 20 °C. The data indicate that whereas the temperature effective period of the Athens third chomosome effects on scutellar bristle number occurs during the third larval instar, a proportion of the negative interaction between second and third chromosomes occurs during the pupal stages.

The data (Table III) also show that at 29 °C the position of extra scutellar bristles is affected during the pupal stages as the largest proportion of extra posterior bristles occurs in flies which complete development at 29 °C.

In some experiments Athens larvae were also transferred to 20 °C to complete development after varying periods of time at 29 °C. These results (Table IV) confirm the finding that the TEP at 20 °C is in the third instar. As flies which complete development at 29 °C have a high proportion of extra posterior bristles (Table IV) it seems likely that the TEP for posterior bristles occurs during the pupal stages.

An interesting feature of these data is that flies which developed for up to 96 h at 29 °C before transfer to 20 °C have a higher mean scutellar bristle number than flies cultured entirely at 20 °C. Exposure to 29 °C prior to the TEP at 20 °C appears to remove a proportion of the negative interaction between Athens second and third chromosomes at 20 °C.

Thus the main TEP for scutellar bristle number is in the third instar between 48 and 98 h after the eggs hatch. The 2 imaginal discs from part of which the scutellum develops are evaginated into the body cavity of the larvae a few hours before the second larval moult and it seems likely that their bristle forming potential is unaffected by temperature before evagination occurs.

Negative interactions affecting scutellar bristle number can sometimes be removed by an appropriate scale. It would be inappropriate to scale out the negative interaction in the Athens stock now it has been shown to have some developmental significance.

Résumé. Chez la Drosophile, le troisième stade larvaire s'avère être la principale période durant laquelle la température exerce une influence sur la formation des poils. Il semble toutefois probable qu'après le début de la pupation la température a un effet sur la localisation des poils surnuméraires. Une interaction chromosomale négative, ayant un effet sur le nombre des poils scutellaires, s'expliquerait par le processus de développement.

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[4] J. R. S. WHITTLE, Ph.D. Thesis, University of Cambridge (1967).
[5] G. P. CHILD, Genetics *20*, 127 (1935).