racic enlargement, a statistically significant decrease in the size of the thymus, and a statistically significant lengthening of life.

A generalized necrobiosis in the spleen, thymus and lymph nodes followed by localized necrosis in animals receiving long continued therapy has been observed. Moderate to intense reticulosis and fibrosis were evident in cases receiving treatment early and over a relatively long period of time.

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INFLUENCE OF HUMIDITY ON THE SURVIVAL OF DIFFERENT CHROMOSOMAL TYPES IN DROSOPHILA PSEUDOOBSCURA

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Populations of *Drosophila pseudoobscura* show a high variability with respect to the gene arrangement in the third chromosome. Several gene arrangements, which must have arisen from each other by inversions of blocks of genes, occur frequently in the same territory. Populations of different localities very often differ in the relative frequencies of the gene arrangements,[1] and in at least some localities, the frequencies change also from month to month, the changes being connected with the succession of year's seasons. In particular, seasonal changes are observed in the populations of Piñon Flats and Andreas Canyon, on Mount San Jacinto in California. The Standard gene arrangement increases in frequency during

the hot period of the summer, remains rather constant during autumn and winter, and decreases in frequency during spring. The Chiricahua arrangement undergoes a cycle opposite in sign to that of Standard, and the Arrowhead arrangement shows relatively little change.[2] These data suggest that carriers of different gene arrangements differ in adaptive value, and that the seasonal changes represent adaptive responses of the populations to changing conditions of the milieu. Artificial populations kept in specially constructed "population cages" bear out the hypothesis of natural selection, in so far as, at relatively high temperatures (above 21°), changes are induced which seem to parallel those observed in natural habitats in summer. Thus, if the initial population of a population cage contains less than 50 per cent of Standard and more than 50 per cent of Chiricahua chromosomes, the former increase, and the latter decrease in frequency, until an equilibrium is established at about 70 per cent Standard and 30 per cent Chiricahua. Similarly, Standard is, at high temperatures, relatively superior to Arrowhead, and Arrowhead is superior to Chiricahua. At temperatures below 21°, the adaptive values of the carriers of all gene arrangements appear to be alike.[3]

The experiments just referred to describe, however, the net differences between adaptive values of the different gene arrangements. It is not known at just what stages of the developmental cycle the differential survival takes place. Furthermore, in the experiments so far published, the carriers of the Chiricahua gene arrangement have never proved superior in adaptive value to those with Standard and Arrowhead. Yet, in the natural populations, Chiricahua chromosomes do increase in frequency at the expense of the others during the spring season, It follows that, an ecological niche should be found in which the carriers of Chiricahua will be relatively superior. One of the environmental agents never tried before which may have an effect on the survival of the chromosomal types, is humidity. The pupal stage is especially likely to be sensitive to humidity variations. Among the known facts which point in this direction, suffice it to mention that, differential mortality of wild type pupae and pupae homozygous for certain mutants has been found in *Drosophila melanogaster* at low humidities.[4]

In the experiments to be described below, *Drosophila pseudoobscura* pupae, homozygous for Standard, Arrowhead, and Chiricahua gene arrangements have been used. The ancestors of all the experimental flies came from the Piñon Flats locality in California. At least ten strains with each gene arrangement were intercrossed, so that the experimental flies, though structurally homozygous, were genically heterozygous (the importance of which is discussed by Wright and Dobzhansky[3]). The parental flies were placed in population cages, some hundreds of males and females of each type in a different one. The cages were kept in a constant temperature

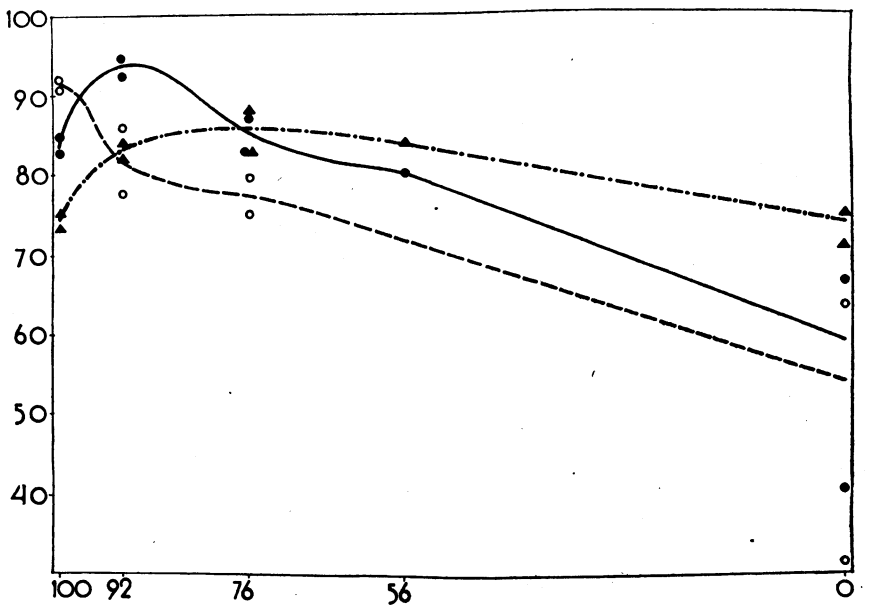

FIGURE 1

Ordinates: percentages of hatched pupae. Abscissae: relative humidity in per cent. Solid circles—Standard pupae; open circles—Chiricahua pupae; triangles—Arrowhead pupae.

TABLE 1

HUMIDITY	GENO-TYPE	FIRST EXPERIMENT PUPAE	FLIES	%	SECOND EXPERIMENT PUPAE	FLIES	%	TOTAL PUPAE	FLIES	%
100%	ST/ST	300	248	82.6	400	340	85.0	700	588	84.0
100%	CH/CH	300	276	92.0	400	363	90.7	700	639	91.0
100%	AR/AR	300	220	73.3	400	300	75.0	700	520	74.5
92%	ST/ST	300	278	92.6	300	284	94.6	600	562	93.6
92%	CH/CH	300	233	77.6	300	258	86.0	600	491	81.8
92%	AR/AR	300	256	82.0	300	252	84.0	600	508	84.6
76%	ST/ST	500	419	83.2	300	262	87.3	800	681	85.1
76%	CH/CH	500	376	75.2	300	239	79.2	800	615	76.9
76%	AR/AR	300	265	88.3	300	250	83.3	600	511	85.1
56%	ST/ST	..	..	..	300	242	80.6	300	242	80.6
56%	AR/AR	..	..	..	200	168	84.0	200	168	84.0
0%	ST/ST	300	122	40.8	700	468	66.9	1000	590	59.0
0%	CH/CH	300	94	31.3	700	446	63.7	1000	540	54.0
0%	AR/AR	300	215	71.0	700	526	75.1	1000	741	74.1

room at 19°, and at relative humidities ranging from 45 to 50 per cent. When pupae began to form in the cages, they were extracted individually by means of a needle, and transferred into glass vials, one hundred pupae per vial. The vials were closed by cheese cloth held by a rubber band.

Only very young and light pupae were taken. The vials were placed in desiccators at the desired humidities. Five relative humidites were used, namely 100%, 92%, 76%, 56% and 0%. They were obtained by placing on the bottom of the desiccators, distilled water, K_2SO_4, NaCl, NaBr in oversaturated solutions, and anhydrous $CaCl_2$, respectively (according to Ludwig and Landsman[4]). The desiccators with pupae were placed at a constant temperature of 25°C.

The experiments were replicated twice. The results obtained are reported in table 1, and represented graphically in figure 1. It can be seen clearly that, at the temperature of 25°C., Chiricahua pupae are more viable than Standard, and the latter more viable than Arrowhead at 100% humidity. At 92% humidity, Standard is superior to the other two. At 76%, Standard and Arrowhead are alike, but both of them are superior to Chiricahua. At lower humidities, Arrowhead is superior to both Standard and Chiricahua. Thus, Chiricahua is most favorable, and Arrowhead least favorable, at 100% humidity, but the relations are reversed at 0%. The two series of experiments showed the same hierarchy of hatchabilities of the pupae with the three gene arrangements, although in the first experiment the hatchabilities were lower in almost all humidities than they were in the second experiment. The difference must have been due to more favorable environmental conditions in the second than in the first series of population cages in which the pupae were reared.

The results of the experiments just reported suggest that, flies with Chiricahua chromosomes are relatively better adapted to climates with high humidities, and Arrowhead flies to low humidities, Standard being intermediate. The temporary superiority of Chiricahua observed during the spring season at Piñon Flats might, then, be due to the relatively high humidities prevailing at that season. The validity of this hypothesis must, of course, be tested by studying the survival rates of pupae at different temperatures.

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