Spontaneous mutant phenotypes found in urban *D. paulistorum* and *D. willistoni* populations.

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The lack of stable, available mutant strains of the species of the *Drosophila willlistoni* subgroup is one of the difficulties to study the genetics of these Neotropical flies, despite their challenging evolutionary characteristics. We are trying to obtain and to maintain all the phenotypic variants of these species that appear in our cultures and collections, since our group is currently performing field studies both in urban and in wild places in the Southernmost State of Brazil (Rio Grande do Sul). Along several years of work, we observed that in urban places, it is relatively common to see the appearance of phenotype alterations in several of the species captured, including the report of an extremely mutant strain of *D. simulans* (Loreto *et al.*, 1998). Here we report some of the variants detected in the sibling *D. willistoni* and *D. paulistorum*, both found in our collections and subject of several studies in our laboratory.

The *D. paulistorum* and *D. willistoni* mutants.

Some *Drosophila paulistorum* and *D. willistoni* strains obtained in periodic collections in the urban area of Porto Alegre city (30°02' S; 51°14' W) show phenotype characteristics resembling those of mutants described in other species of the genus *Drosophila*. In certain cases it was possible to determine their types of inheritance. In others, however, it was only possible to describe and to characterize phenotypically each mutation, because they were apparently sterile.

D. willistoni.

1. Antenna-to-leg transformation and ectopic eyes. After 22 generations of a single strain culture established in our laboratory, a *D. willistoni* male emerged with the phenotype presented in Figure 1a and b. Its phenotype includes: a small leg in the place of antenna, with large portions of eye ommatidea tissue. This male was mated with virgin females of the same strain, and all the offspring produced presented the wild type phenotype. No other individuals with the same phenotype were observed in the subsequent generations. This bizzarre phenotype called our attention because recently Loreto *et al.* (1998) described a similar mutant in a hypermutable strain of *D. simulans,* also captured in the same Porto Alegre city. In that case, the mutant presented incomplete penetrance and its expression is strongly influenced by the temperature of the culture chamber, apparently being 29°C the more effective one. Until now we have not performed shift down and shift up temperature assays to verify if the mutant here described in *D. willistoni* is an analogous mutant with that spontaneously found in *D. simulans*.

2. One-winged flies. Figures 1c and d show a female of *D. willistoni* of the other strain. This female was mated with wild males of the same strain, but no offspring was produced, although no anatomic abnormalities were detected in the reproductive organs of this fly. In *D. subobscura,* one-winged flies can arise in the *Va/Ba* strain, and in the descendents of the cross between the mutant strain with wild individuals. The mutant genes *Va* and *Ba* present very variable expressivity, being lethal in homozygous condition. It was also observed that the absent wing is always replaced by a thoracic structure of variable size, very similar to that described in Figures 1c and d. (Sperlich *et al.,* 1977; Mestres and Busquets, 1991; Orengo and Mestres, 1993; Orengo *et al.*, 1997).

3. Haltere to wing transformation. A single, sterile female of *D. willistoni* presented the transformation of one haltere to one wing in the third thoracic segment. No other alteration besides the infertility was observed (Figure 1e). It is similar to mutants of the homoeotic *Ultrabithorax* (*Ubx*) gene, which normally affects both the metathoracic (T3) and the first abdominal segments (A1); the haltere primordia in T3 expands to the size of wing primordia (White and Wilcox, 1985).

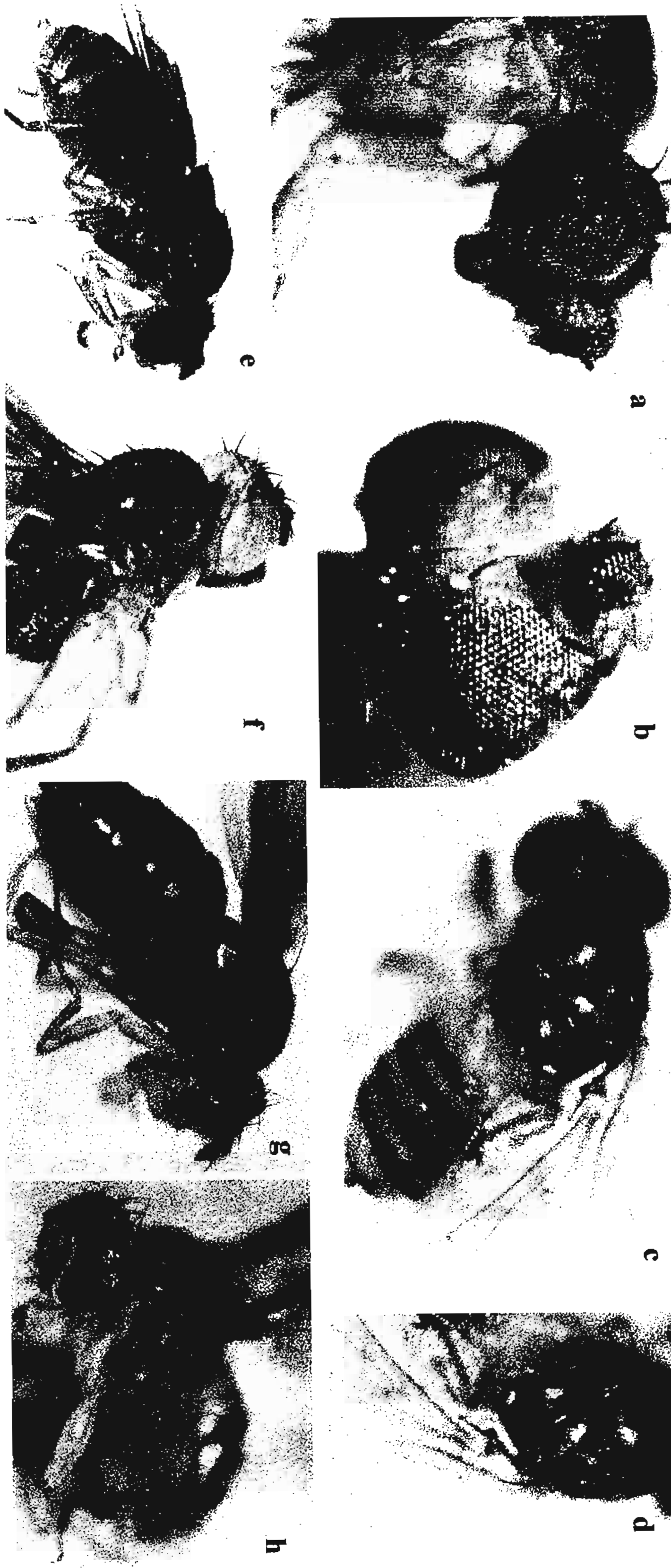

Figure 1. Mutant spontaneous phenotypes in *Drosophila willistoni*: a, b) homeotic leg to antenna transformation with ectopic eyes in the transformed leg; c, d) one-winged fly; e) wing to haltere transformation. In *D. paulistorum*: f) *white* eyes; g) *Bar* eyes; h) *lozenge*-like eye mutant.

D. paulistorum.

1. The *white* mutant (Figure 1f). In the offspring of two laboratory populations of *D. paulistorum* we observed six males with the characteristic *white* phenotype, inherited as a X-linked recessive allele (see Lindsley and Zimm, 1992).

2. The *Bar* mutant. Figure 1g shows one female descendent of the F1 of the mass cross between three mutant males and seven wild females found in a population of *D. paulistorum*. This mutant strain presented extremely variable phenotypic expression, being the fly in Figure 1h representative of the more extreme expression of the gene. As it occurrs in *D. melanogaster*, this gene is X-linked in *D. paulistorum*. This phenotype disappeared from the strain after a bottleneck induced by temperature accidental elevation of the culture chamber. The lack of the mutant phenotype may be also a consequence of a reversion of the phenotype to the wild one, or both phenomena. The first known *Bar* mutation was isolated by Tice as a single male in 1914. Homozygous or hemizygous *Bar* flies have narrow eyes in which the facet number has been reduced from the wild-type number. The mutations are all associated with chromosomal rearrangements as *tandem* duplications or inversions and translocations sharing a common breakpoint within the 16A1-2 region of the X chromosome (Tsubota *et al.*, 1989). Zeleny (1919, 1921) reported the instability of the mutation and its revertion to the wild type at the frequency of 1 in 1000 to 2000. Sturtevant (1925) suggested that this mutation was restricted to females and associated with the recombination, unequal crossing-over being the phenomenon responsible for *Bar* instability.

3. The *lozenge*-like mutant (Figure 1h). Seven eye-mutant males emerged in a same strain after six generations of rearing in laboratory. Both phenotype and genetic pattern are similar to those described in *D. melanogaster* (see Lindsley and Zimm, 1992) and in the same hypermutable strain of *D. simulans* already mentioned (Loreto *et al.*, 1998). The sterility of the homozygous female is a consequence of the detected absence of spermathecae.

4. The *yellow* mutant. Six yellow-pigmented body males were found in a recently established strain at the fourth generation (photos not shown). The gene is X-linked, similar to the same gene reported for other species of the genus (see Lindsley and Zimm, 1992). This strain is stable, being easily kept in our laboratory.

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Recovery and mapping of an *Antennapedia* mutation in *Drosophila simulans.*

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Hox genes are critical players in determining the basic body patterns of all animals and have attracted much attention from both developmental and evolutionary biologists (Carrol, 1995). While performing an X-ray mutagenesis screen (~ 4000 rad) for X chromosome deletions in *Drosophila simulans*, we recovered an apparent *Hox* gene mutation — a dominant *Antennapedia*-like allele (*Antp*). Most mutations in *D. simulans* are homologous to known mutations in *Drosophila melanogaster*. For recessive mutations, homology is easily established by complementation tests in species hybrids. However, because the *D. simulans Antp*-like mutation is dominant and likely homozygous lethal (*i.e.*, we were unable to construct homozygous lines), complementation tests were not possible. We thus attempted to infer homology by mapping *Antp* using visible markers available within *D. simulans*.