In the hybrid male nuclei, though the unusual increase of the X chromosome and micro-chromosome are evident and also have been reported earlier (Bicudo & Richardson), the coexistence of two homologue with such differential diameter for all chromosomal elements in the hybrid females is undoubtedly unique. Howver, the similar staining intensity and synchronous pattern of replication between these two homologue suggests that the unusual increase in diameter between these two homologue is probably due to similar chromatin condensation between them but additional polyteny in one homologue over the other.

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Effect of transforming mutants on the X chromosomal replication pattern in Drosophila melanogaster.

In Drosophila melanogaster, sex determination is under the control of X chromosome/A autosome ratio (Bridges) as well as wild type alleles of the sex-transforming mutants (Baker & Ridge). With the help of such sex-transforming mutants and by changing the sexual physiology of the flies, attempts have been made to study the role of altered sexual physiology on X chromosomal gene expression (Muller; Komma; Smith & Luchesi). In our present study, we have examined the ^{3}H-TdR labelling pattern of the salivary gland chromosomes in changed physiological conditions with a view to determine the effect of such sex-transforming mutants on the X chromosomal replication pattern. Five such mutants viz., sex-combless (sx), double sex (dsx), double sex dominant (dsx^{D}), intersex (ix) and transformer-2 (tra-2) were used in our present study and DNA replication pattern have been examined in 6 genotypic conditions vix., sx/Y, dsx/dsx; XY, dsx/dsx; XX, dsx^{D}/+; XX, ix/ix;XX tra-2/tra-2;XX.

Autoradiograms reveal that generally while the X chromosomes in sex-combless males (sx/Y) and male intersexes (dsx/dsx; XY) are early replicating (Fig 1a,b) than the remaining autosomes, the X chromosome in pseudo-males (tra-2/tra-2;XX) and three types of female interesexes.

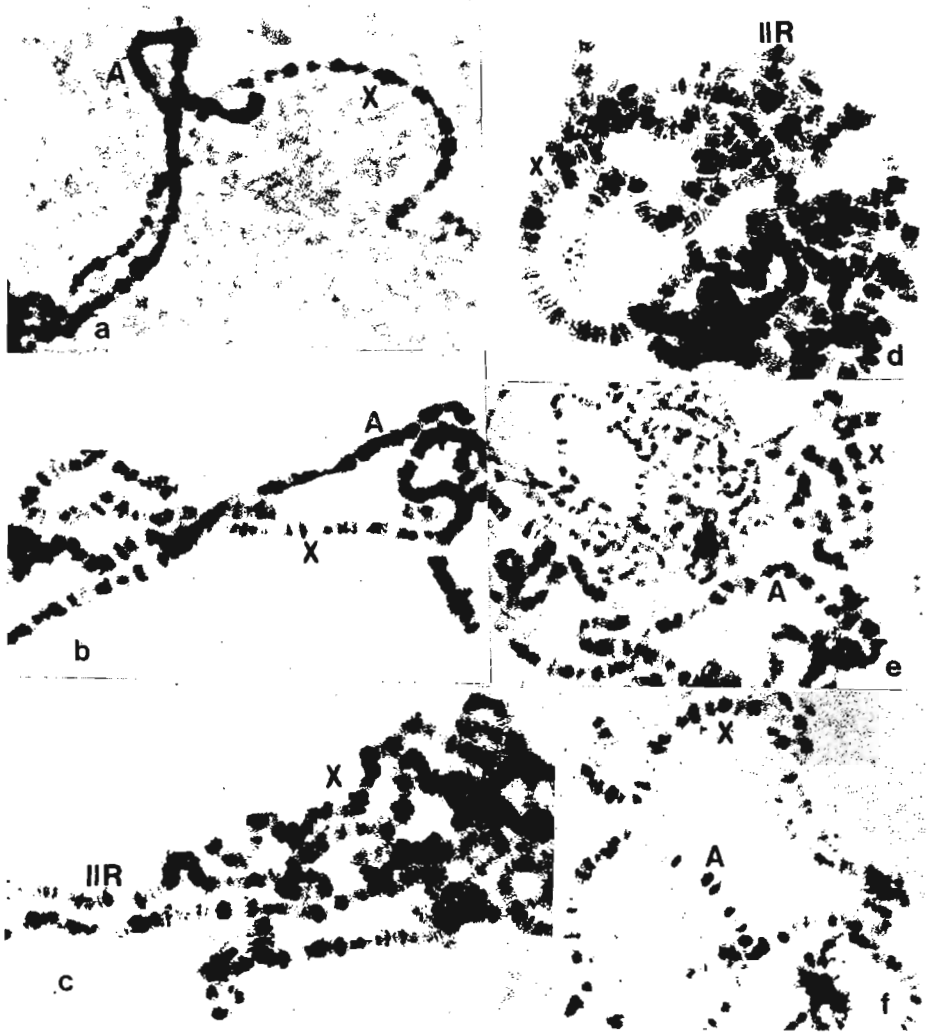

Fig. 1. Autoradiograms showing ^{3}H-TdR labelling on the X chromosome in comparison to the pattern on the autosome in
(a) dsx/dsx;XY,
(b) sx/Y,
(c) ix/ix;XX,
(d) tra-2/tra-2;XX,
(e) dsc/dsx;XX and
(f) dsx^{D}/+;XX.
X = X chromosome,
A = autosome.

(dsx/dsx;XX, dsx^D/+;XX and ix/ix;XX) replicate in a synchronous manner along with the autosomes (Figs. 1c-f). However, the detailed sitewise analysis of the ^{3}H-TdR labelling reveal that, in each condition, there are significant reproducible alterations for some replicating sites on the X chromosome. Among these six experimental conditions, the number of altered sites are maximum (eleven) in pseudomales (tra-2/tra-2;XX), minimum (one) in sexcombless males (sx/Y) and in remaining cases it is two in dsx/dsx;XY and seven in all the three female intersexes (dsx/dsx;XX, dsx^D/+;XX and ix/ix;XX). Our results, however, fail to establish a positive correlation between the changed sexual physiology and the altered labelling frequencies on the X chromosomes. At the same time, significant change in labelling frequency of some autosomal sites in pseudomales (tra-2/tra-2;XX) and male and female intersexes (dsx/dsx;XY and dsx/dsx;XX) indicate that the effect of these sex-transforming mutants are not only limited to X chromosomal replication.

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X-chromosome replication in Drosophila.

The majority of the existing evidences on the replicative and transcriptive activity of the salivary gland chromosomes in sex-specific lethals (Belote & Lucchesi 1980; Lucchesi & Skripski 1981; Ghosh et al. 1981), different karyotypic conditions (Maroni & Plaut 1973; Annaniev & Gvozdev 1975; Lucchesi 1977) as well as different Drosophila species (Mukherjee & Beermann 1965; Lakhotia & Mukherjee 1970, 1972; Abraham & Lucchesi 1973; Mukherjee & Chatterjee 1976; Das et al. 1982) points to an intriguing relationship between relative diameter, level of transcriptive activity and duration of replication of the X chromosome. Still today, several models have been proposed (Mukherjee 1974; Lucchesi 1977; Davidson & Britten 1979; Mukherjee 1982) to explain the regulatory

Fig. 1. Autoradiograms showing ^{3}H-TdR labelling on X chromosomes in comparison to the pattern on the autosome in (a) 1.62 X chromosomal segment (b) 2.15 X chromosomal segment and (c) in metafemale (3X;2A). A=autosome, X=X chromosome. Arrow indicating the break points.