Hess, Oswald. Max-Planck Institut für Biologie, Germany. Mutation and localization studies in the Y chromosome of D. hydei.

During the growth stage of the primary spermatocytes five sites of the Y chromosome of D. hydei form loops, which in principle are organized in the same way as the loops of lampbrush chromosomes in Amphibian oocyte nuclei. According to their different morphology the five loops are called threads (F), pseudonucleolus (P), clubs (K), tubular ribbons (T), and noose (S). For the localization the long arm of the Y chromosome is divided into ten equal segments which are designated 1-10 starting at the kinetochore. The loci of the loops have been mapped as follows (fig. 1): threads in segment 10 or 9, pseudonucleolus in segment 9 or 8, tubular ribbons in segment 2 or 3, clubs in segment 1, and noose on the short arm.

By X irradiation the following X.Y-translocation chromosomes have been induced:

a) T(X,Y), 340/7: $Y^{(S,K,T)}$. w 1t

b) T(X,Y), 340/2: $Y^{(S,K)}$. w 1t

c) T(X,Y), 290/1: $Y^{(S)}$. w 1t

d) T(X,Y), 340/10: w 1t.$Y^{(F)}$

The four translocation chromosomes possess a complete euchromatic arm of the X which is marked by white light; the heterochromatic arm is lost. The translocated Y chromosome fragments differ in respect to the loops which they possess. Translocations a, b, and c have kinetochores from the Y chromosome, translocation d from the X chromosome. Males and homozygous females have normal viability; males without an additional complete Y chromosome are sterile.

Besides these X.Y-translocations one Y-autosome translocation and one Y fragment have been induced by X rays:

e) T(Y,A), vermilion-1: $Y^{(S,K,T)}$.A and A.$Y^{(P,F)}$

f) $Y^{(S,K,T)}$

The translocation chromosomes of the autosomal translocation segregate independently, because the autosomal break point lies next to the kinetochore. Both translocation chromosomes of this reciprocal translocation can, therefore, be crossed into other stocks. The Y fragment includes segments carrying the organizers for the tubular ribbons, the clubs, and the noose. The distal part of the long arm containing organizers of threads and pseudonucleolus are lost.

In addition, two mutants of one of the loops, the threads, have been induced by X-irradiation (fig.2). In the first mutant, called "tube-proximal", the normally compact proximal sections of the threads are changed into tubes, whereas the distal diffuse sections are unchanged (fig. 2b). In the second mutant, "tube-distal", the distal sections are changed into two knots of narrow tubes and the proximal compact sections are not altered (fig. 2c). It has proved possible to build up stocks in which all the males have Y chromosomes carrying the mutation tube-proximal, and stocks in which all the males have the mutation tube-distal.

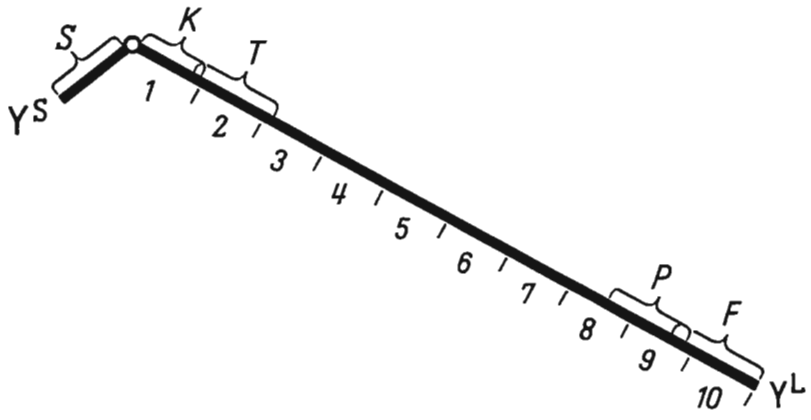

Fig. 1: Diagram of the Y chromosome of D. hydei, showing the loci of the five spermatocyte loops. Explanations: S, noose; K, clubs; T, tubular ribbons; P, pseudonucleolus, F, threads; Y^S, Y^L, short and long arm.

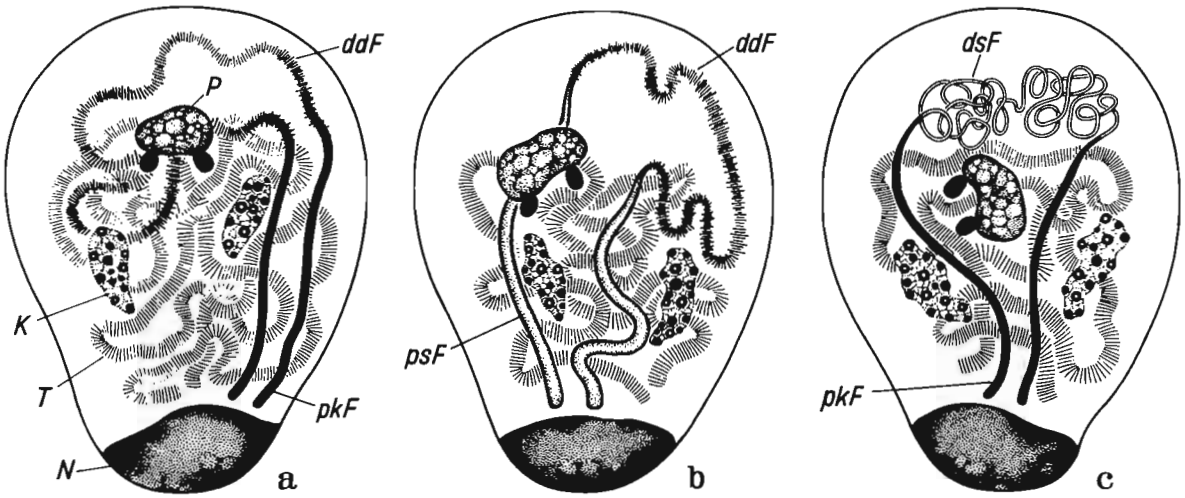

Fig. 2: Loops in the spermatocyte nucleus of normal (a), tube-proximal (b) and tube-distal, (c) male. Explanations: ddF, diffuse distal (normal), dsF, tubular distal sections (tube-distal) of the threads; pkF, proximal compact (normal), psF, proximal tubular sections (tube-proximal) of the threads; N, nucleolus. For other abbreviations, see fig. 1.

Pelecanos, M. University, Thessaloniki, Greece. The mutagenic effect of the duration of treatment with diethyl sulphate on previously starved adult males.

Previous communications have shown the importance of diethyl sulphate as a mutagenic agent. (Pelecanos 1962, Pelecanos and Alderson, 1963). Moreover, the mutagenic activity of above mentioned chemical has been studied in detail by the same workers and the data obtained are already in press.

The present report describes the results of some preliminary experiments the aim of which was twofold:

1. Study the effect of the duration of treatment upon the yield of mutations induced by the feeding of diethyl sulphate.
2. Assess whether a prior starvation treatment of the adult males would alter the frequency of induced mutations.

In all our previous experiments, newly emerged Oregon-K males were treated immediately after collection, while in the present two series of experiments, they have been either fed for 24 hours in an ordinary medium, or starved for 24 hours before the treatment. The same diethyl sulphate solution has been used throughout each experiment despite the different rate of hydrolysis over the different periods of treatment. The method used for feeding the flies has been described elsewhere (Pelecanos and Alderson 1963). After the treatment the males were tested for sex-linked recessive lethal mutations by the Muller-5 method. Each male was individually mated to two females for three days; only the first brood is recorded here.

The results are gathered in Tables I and II.

Table I shows that when a 24 hour starvation preceded the treatment, there was essentially a linear relation between the duration of treatment and the mutagenic effect. On the contrary, when newly emerged males have been fed for 24 hours in an ordinary laboratory food medium