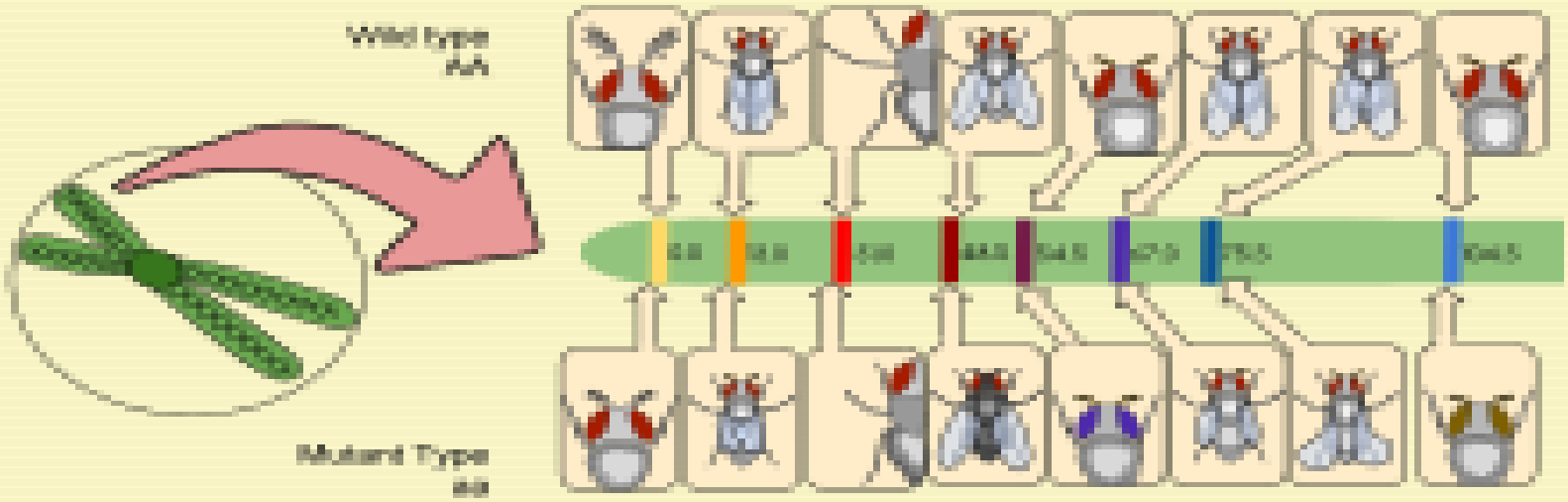
254 Bot

POLYTENE CHROMOSOMES

ANATOMY OF SALIVARY GLANDS

DROSOPHILA

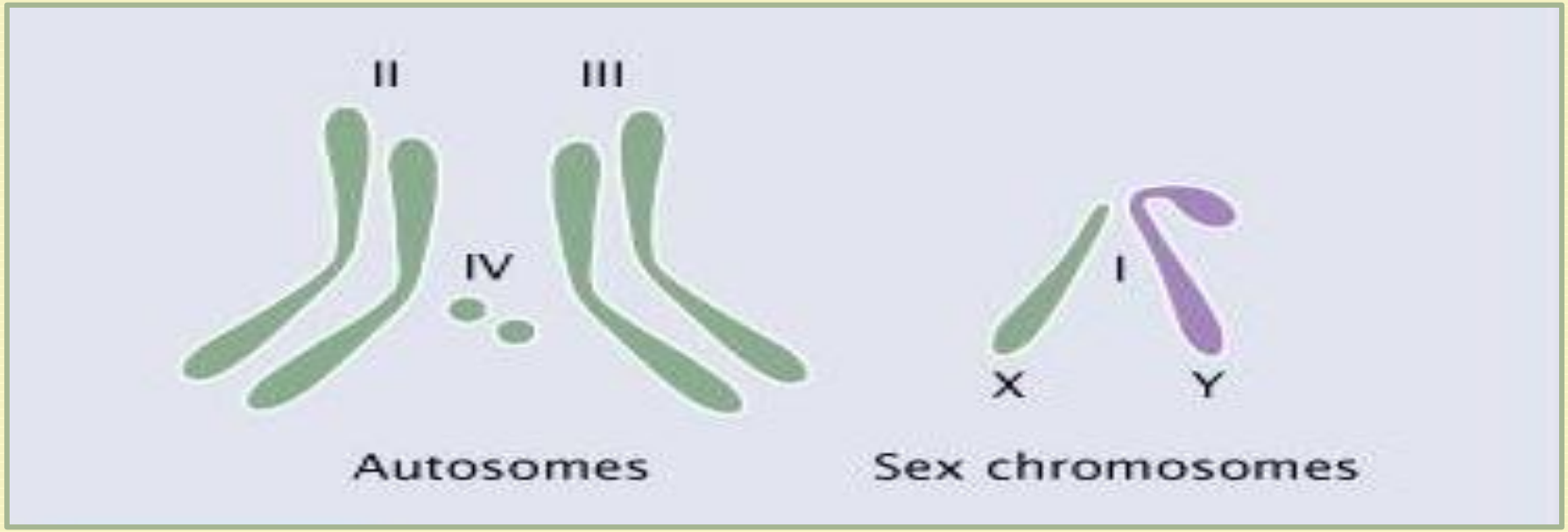


LAB 4

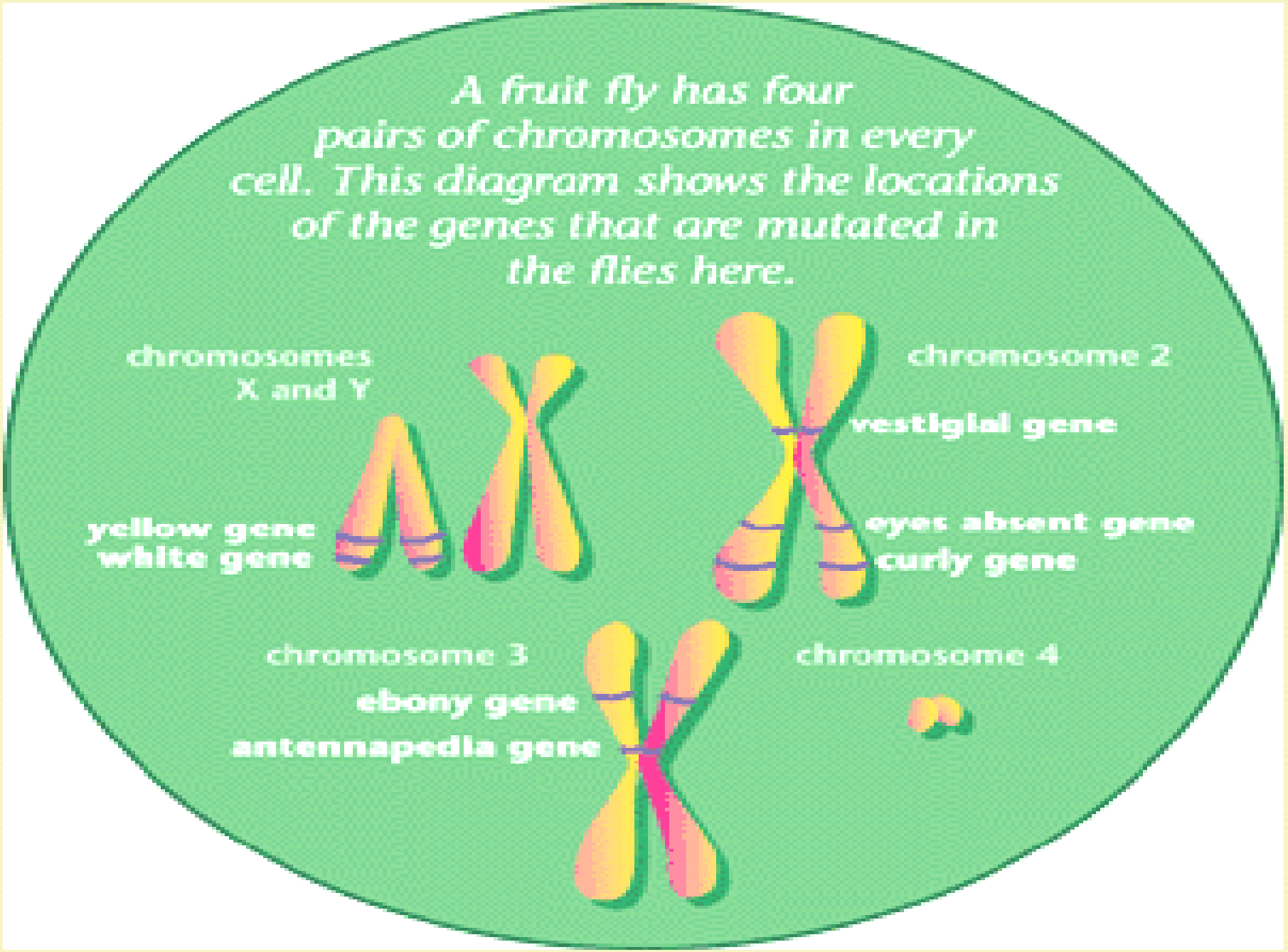
Why *Drosophila melanogaster* is such a good model organism ?

- **Its care and culture require little** equipment, space, and expense (low cost)
- **Short Life Cycle** (10 days - Temperature Dependent 25ºC) so several generations can be studied within a few weeks.
- **It has a high fecundity (females lay up to 100 eggs per day, and perhaps 2000 in a lifetime).**

- Males and females are readily distinguished
- The mature larva has giant chromosomes in the salivary glands called **polytene chromosomes**, "puffs", which indicate regions of transcription.
- **It has only four pairs of chromosomes - three autosomes, and one pair of sex chromosomes**.
- Suitable of Genetic Manipulation



- **The X and Y chromosomes are involved in sex determination, and are thus called the sex chromosomes.**
- **Gene Sequence Conservation** with humans: **60%**


A fruit fly has four pairs of chromosomes in every cell. This diagram shows the locations of the genes that are mutated in the flies here.
chromosomes X and Y
yellow gene
white gene
chromosome 2
vestigial gene
eyes absent gene
curly gene
chromosome 3
ebony gene
antennapedia gene
chromosome 4

POLYTENE CHROMOSOME

Polytene chromosomes are large chromosomes which have thousands of DNA strands. They provide a high level of function in certain tissues such as salivary glands.

WHERE ARE THESE CHROMOSOMES LOCATED?

In insects, polytene chromosomes are commonly found in the salivary glands; they are also referred to as "salivary gland chromosomes". The large size of the chromosome is due to the presence of many longitudinal strands called chromonemata; hence the name polytene (many stranded).

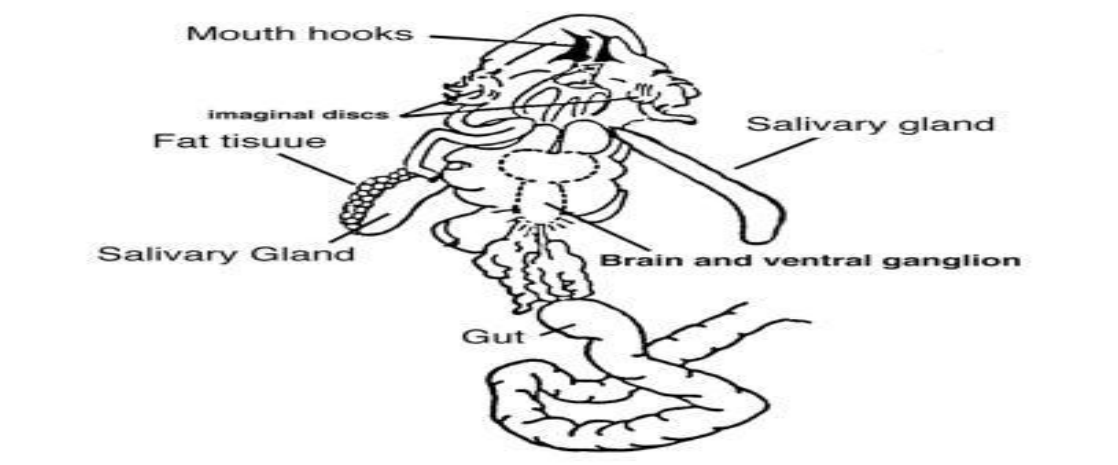
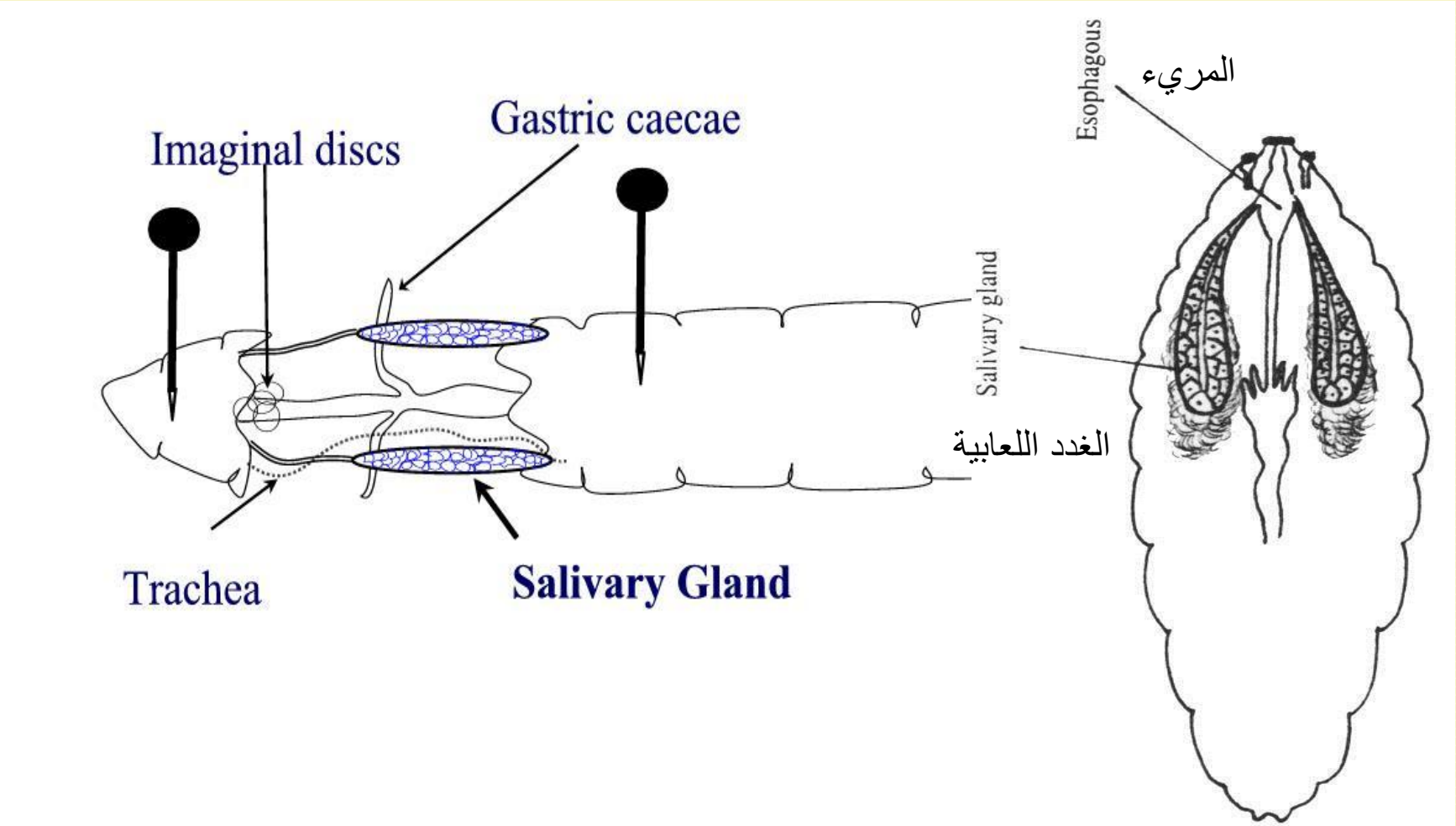


Diagram of head with attached salivary glands and ventral ganglion remaining

WHERE IS IT LOCATED AND HOW TO GET IT?



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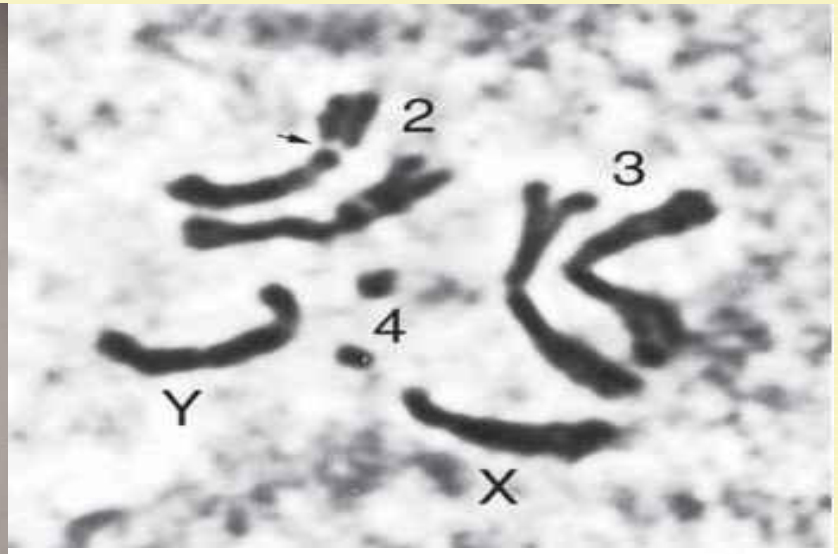
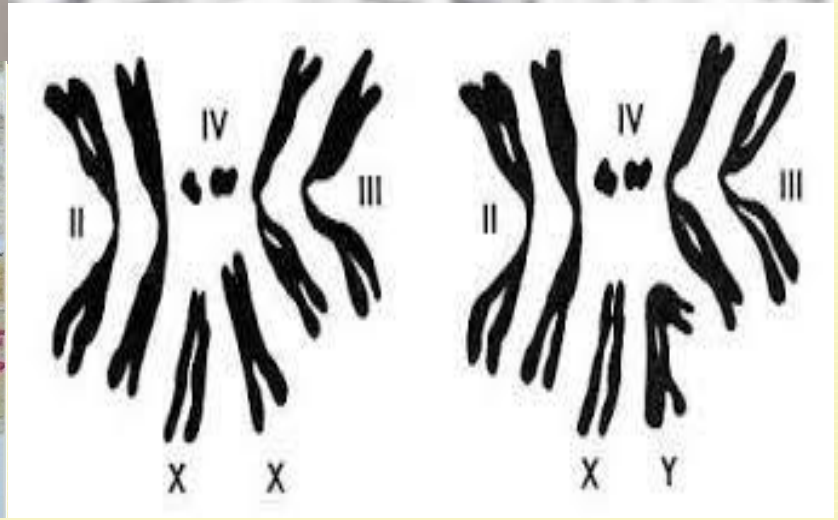




Polytene chomosome from the salivary gland of Drosophila melanogaster (stained)

A polytene chromosome from Drosophila salivary gland

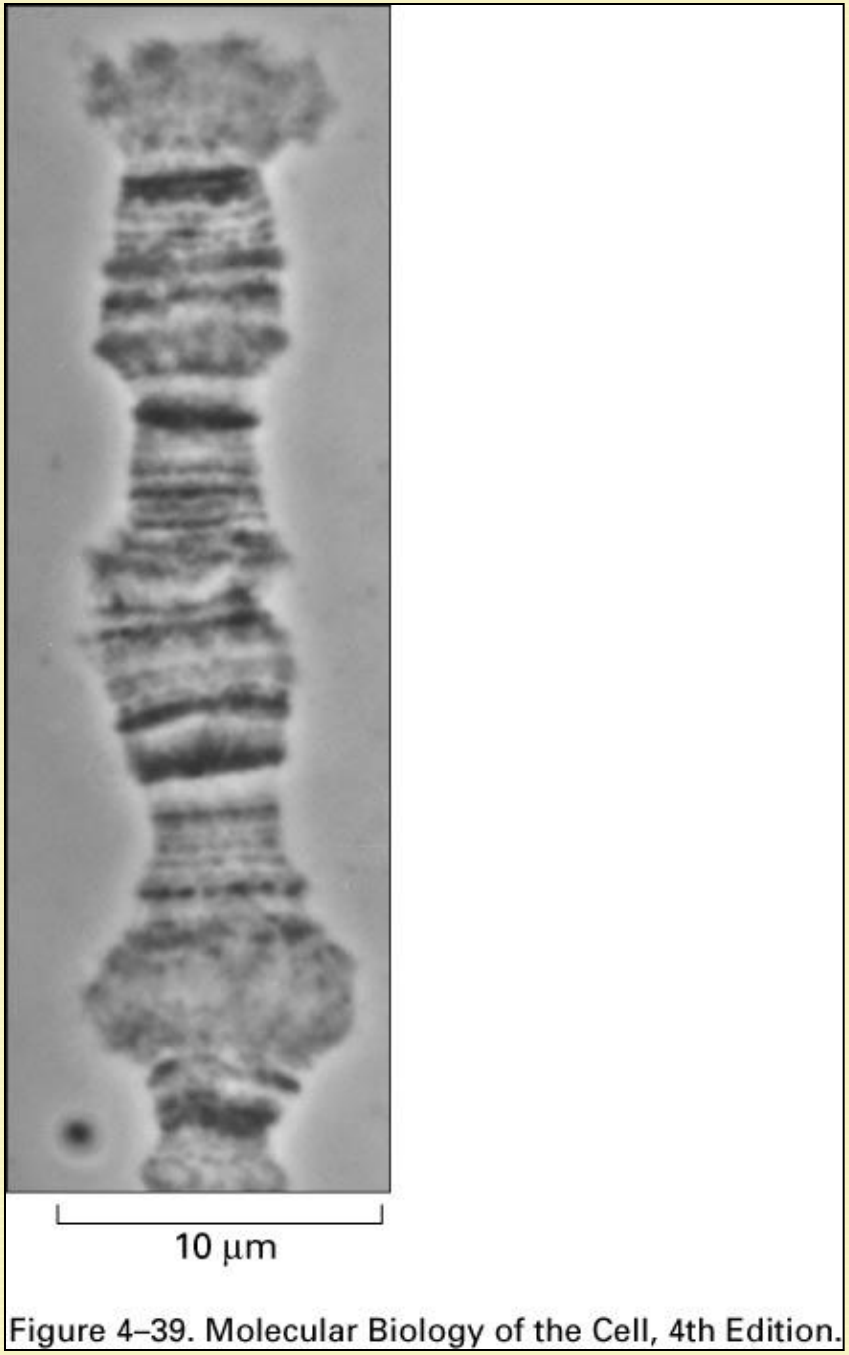


Figure 4–39. Molecular Biology of the Cell, 4th Edition.

RNA synthesis in Chromosome puffs
Red: newly synthesized BrUTP; Blue: old ones diffused

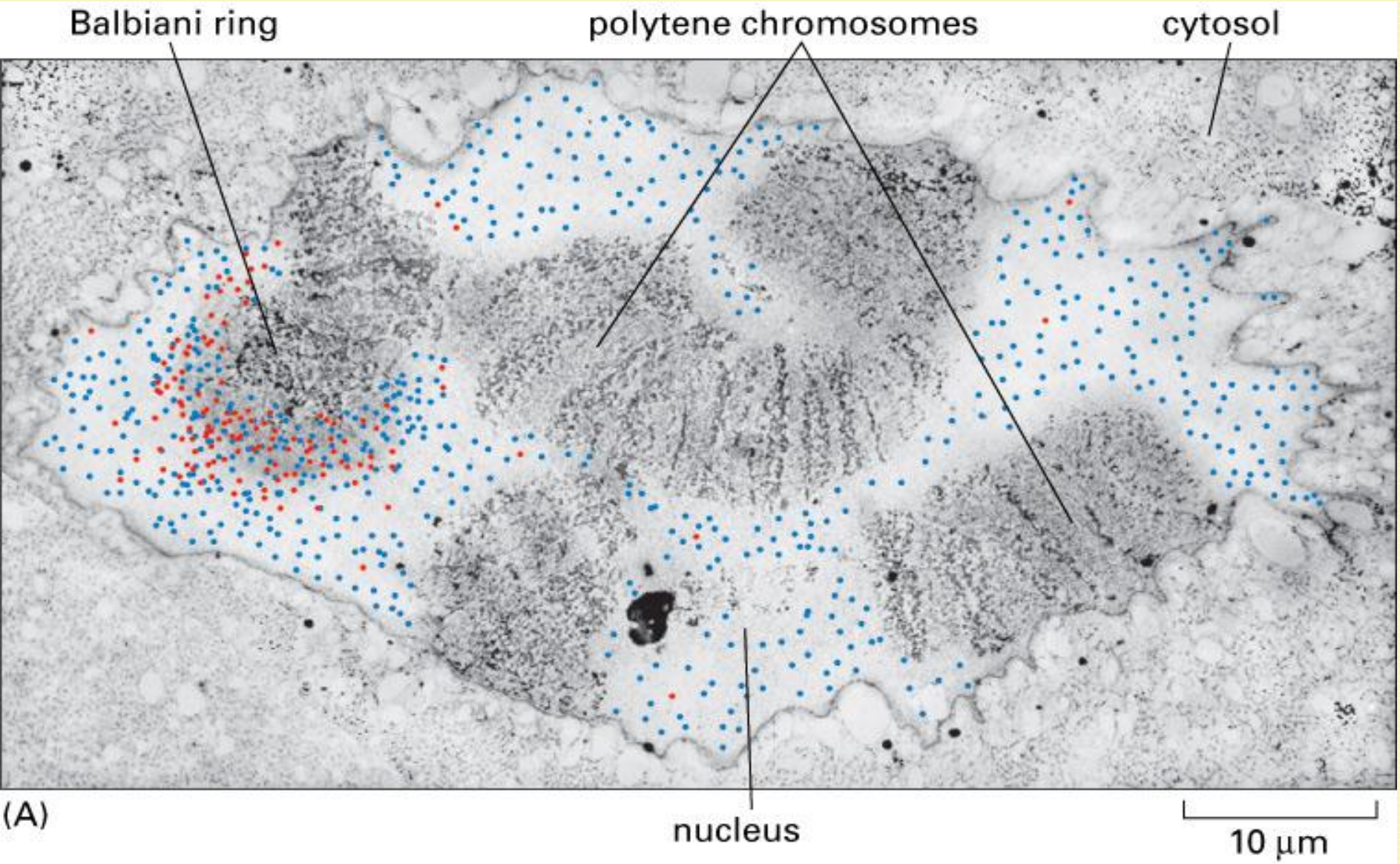


Figure 4–42 part 1 of 2. Molecular Biology of the Cell, 4th Edition.

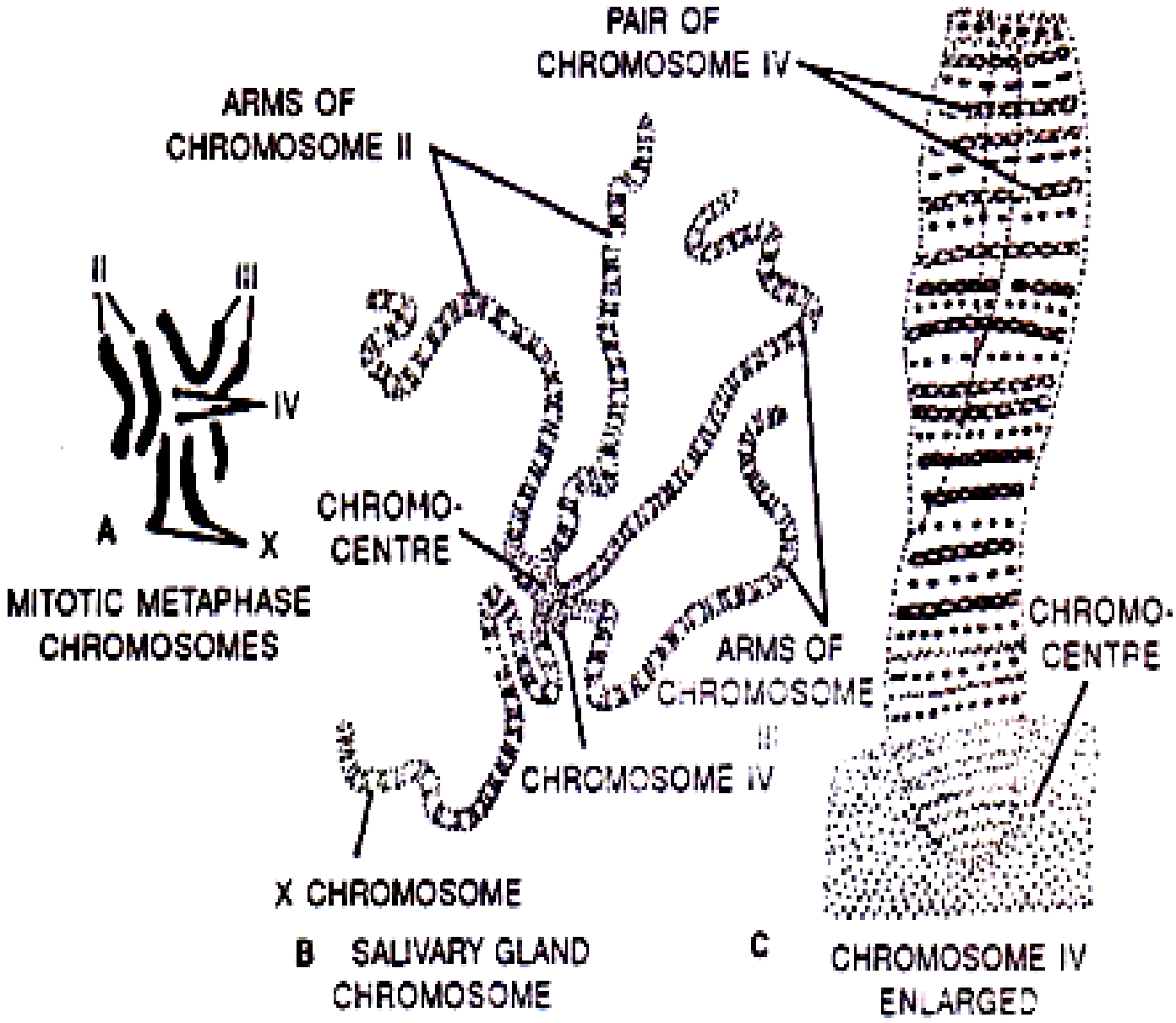


Figure 3.24 Normal and polytene chromosomes of *Drosophila melanogaster* **A**—Normal mitotic chromosomes ; **B**—Polytene chromosomes of female . **C**—An enlarged IV chromsome

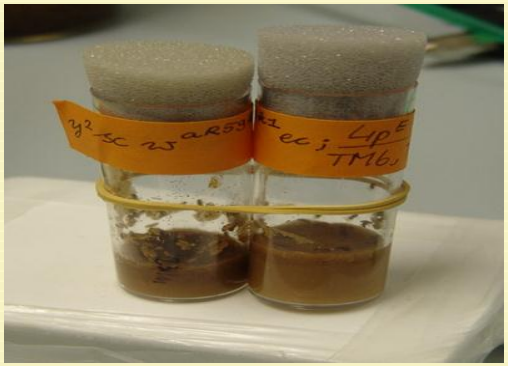
Procedures

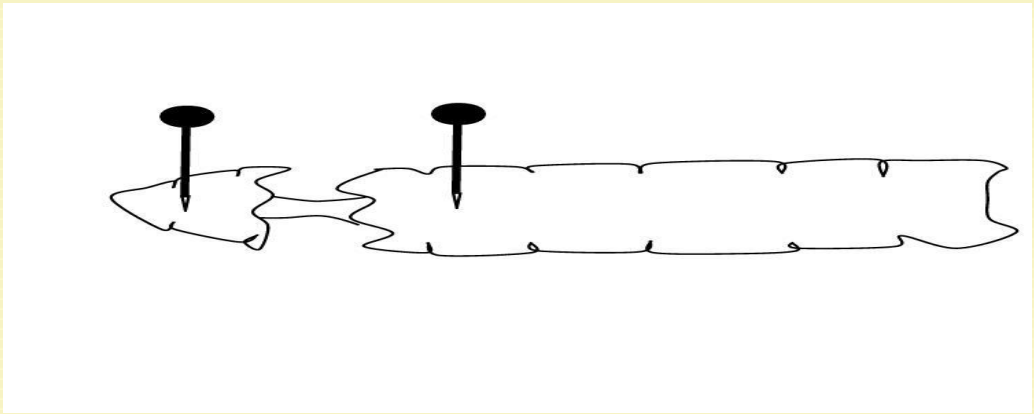
Removing the salivary glands:

1. Remove a large larva (third instar) from the stock of D. fly.

*** Larger larvae are easier to dissect. However, select an active larva and one that has not started to pupate.**

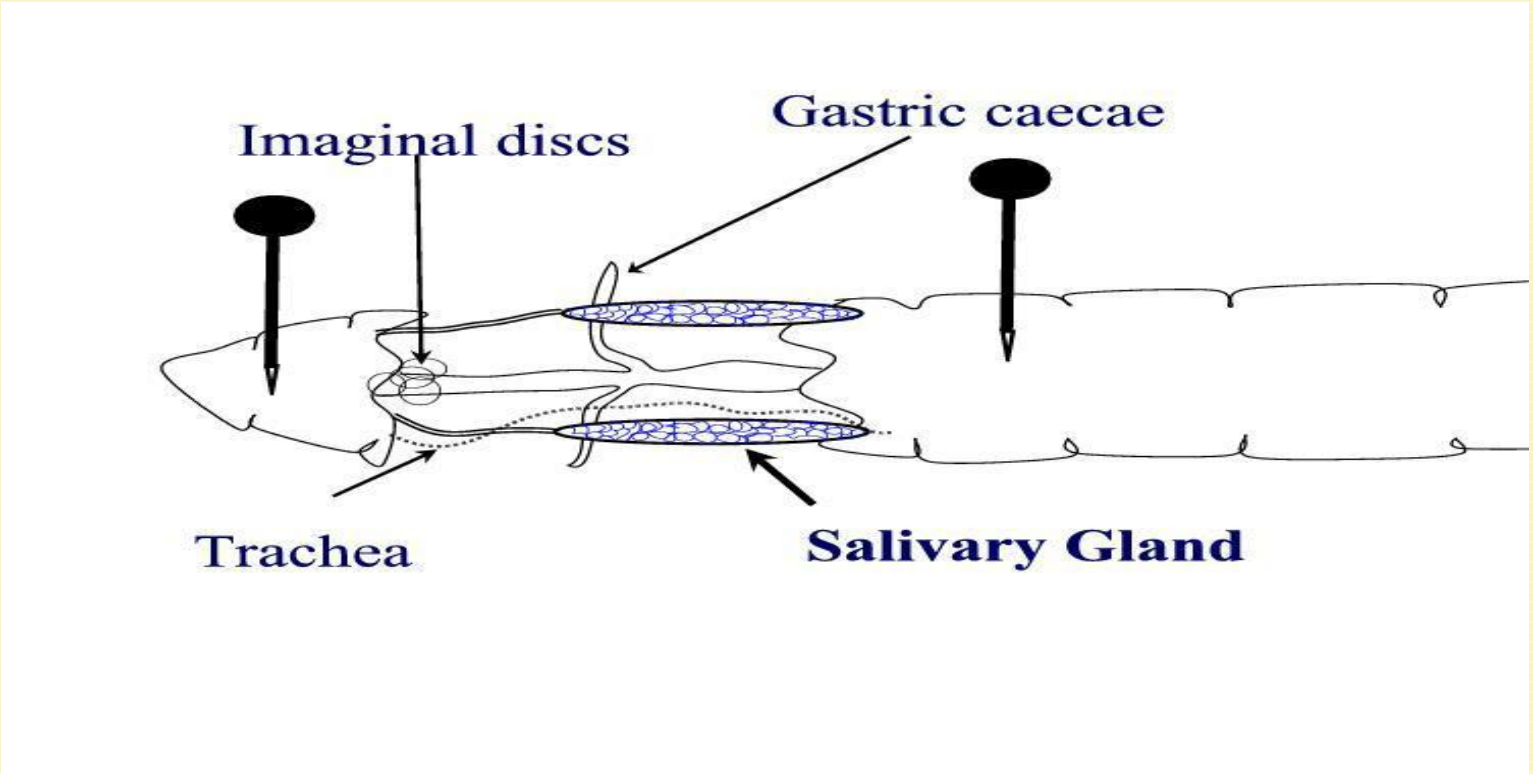
2. Dissect the larva by placing one needle on the posterior aspect of the larva and the other needle at the anterior end, near the black mouth parts.



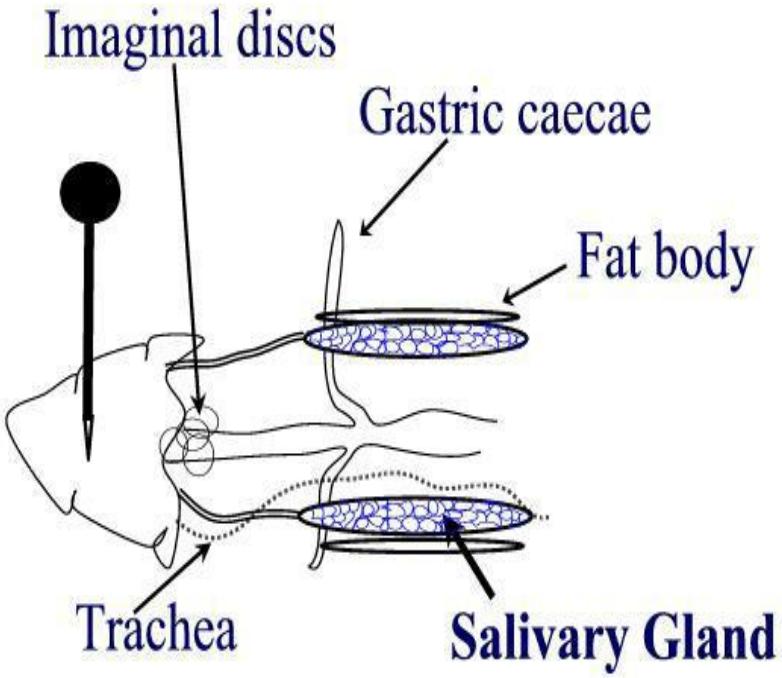


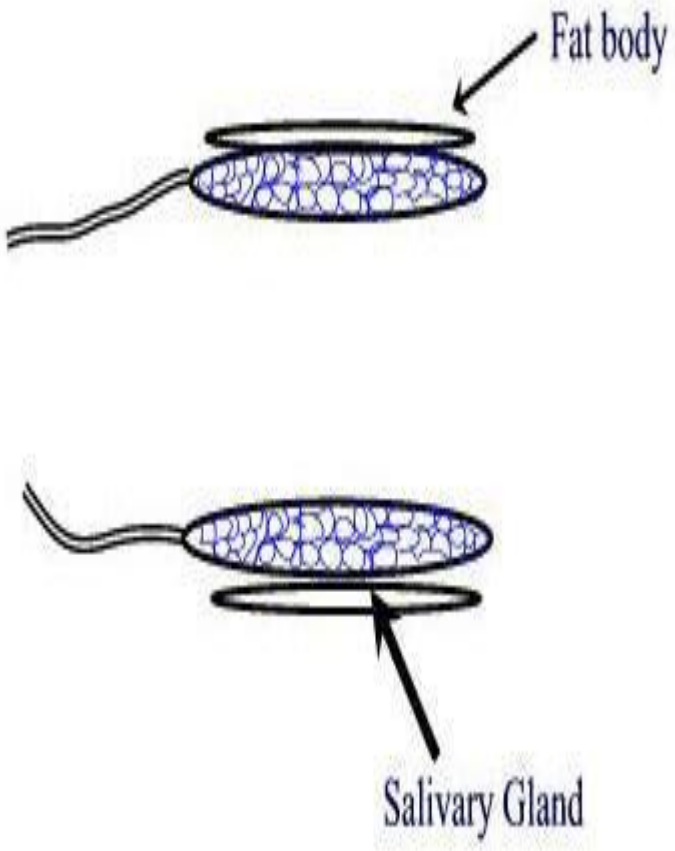
3. Carefully pull outward with the anterior needle.

4. There are two transparent salivary glands located anteriorly in the larva. The glands are characterized by a granular, bead-like appearance. A narrow, white ribbon of fat surrounds the glands and should be torn away.



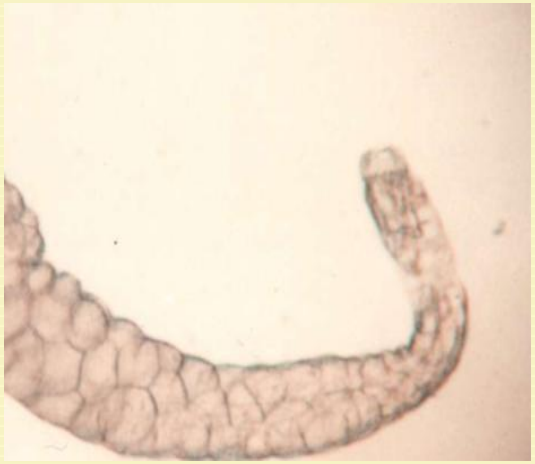
5. Discard all of the larva except for the salivary glands.

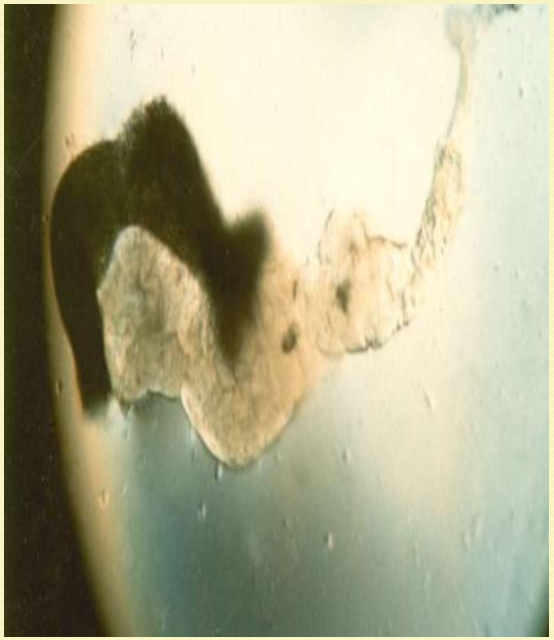




Staining and Observing

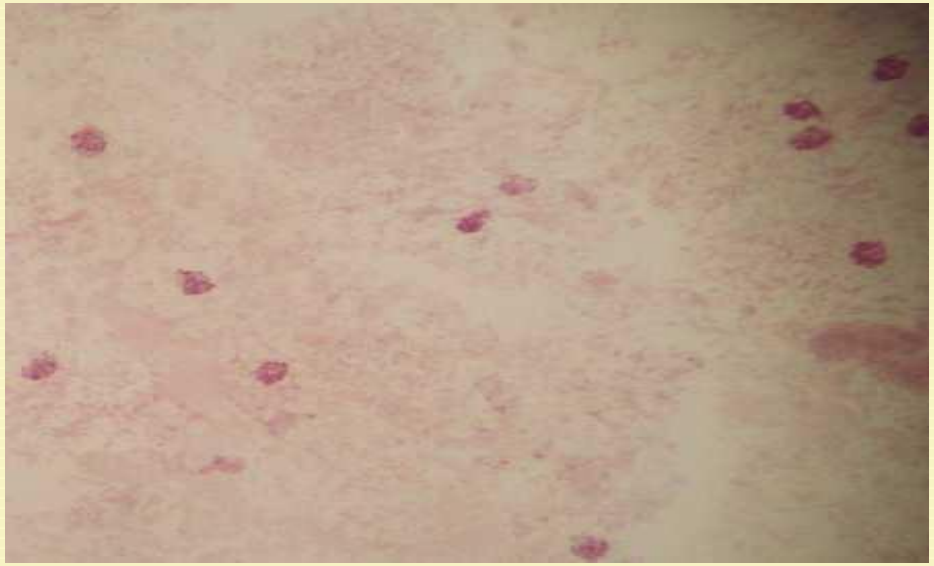
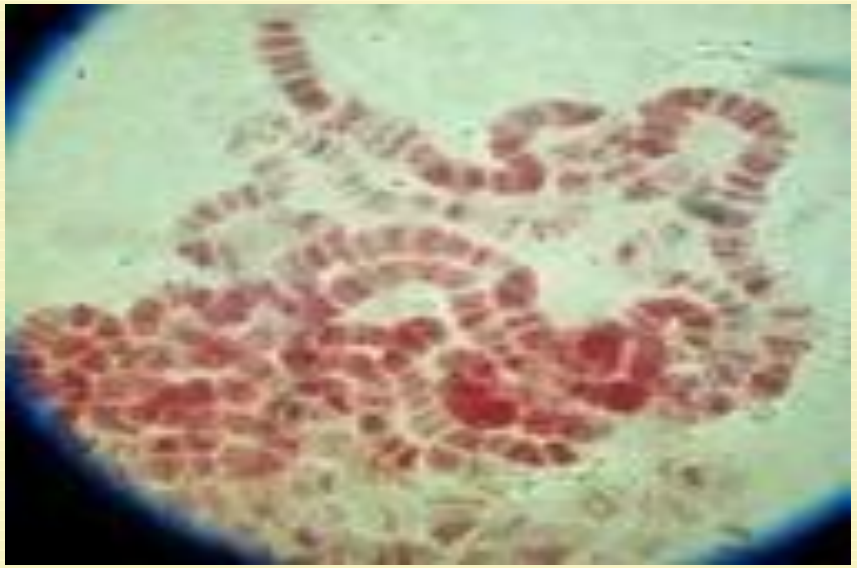
- **Place 2 drops of aceto-orcein stain on the salivary glands, and let it stand for 10 minutes.**
- **Place a cover slip over the glands, and using your thumb and a paper towel, push down on the slide. The pressure applied will squash the glands, rupture the nuclear membrane, and free the chromosomes.**
- **Using a compound microscope, observe the slide under low and high magnification.**
- **Make the slide permanent by brushing along the edges of the cover slip with clear nail polish.**

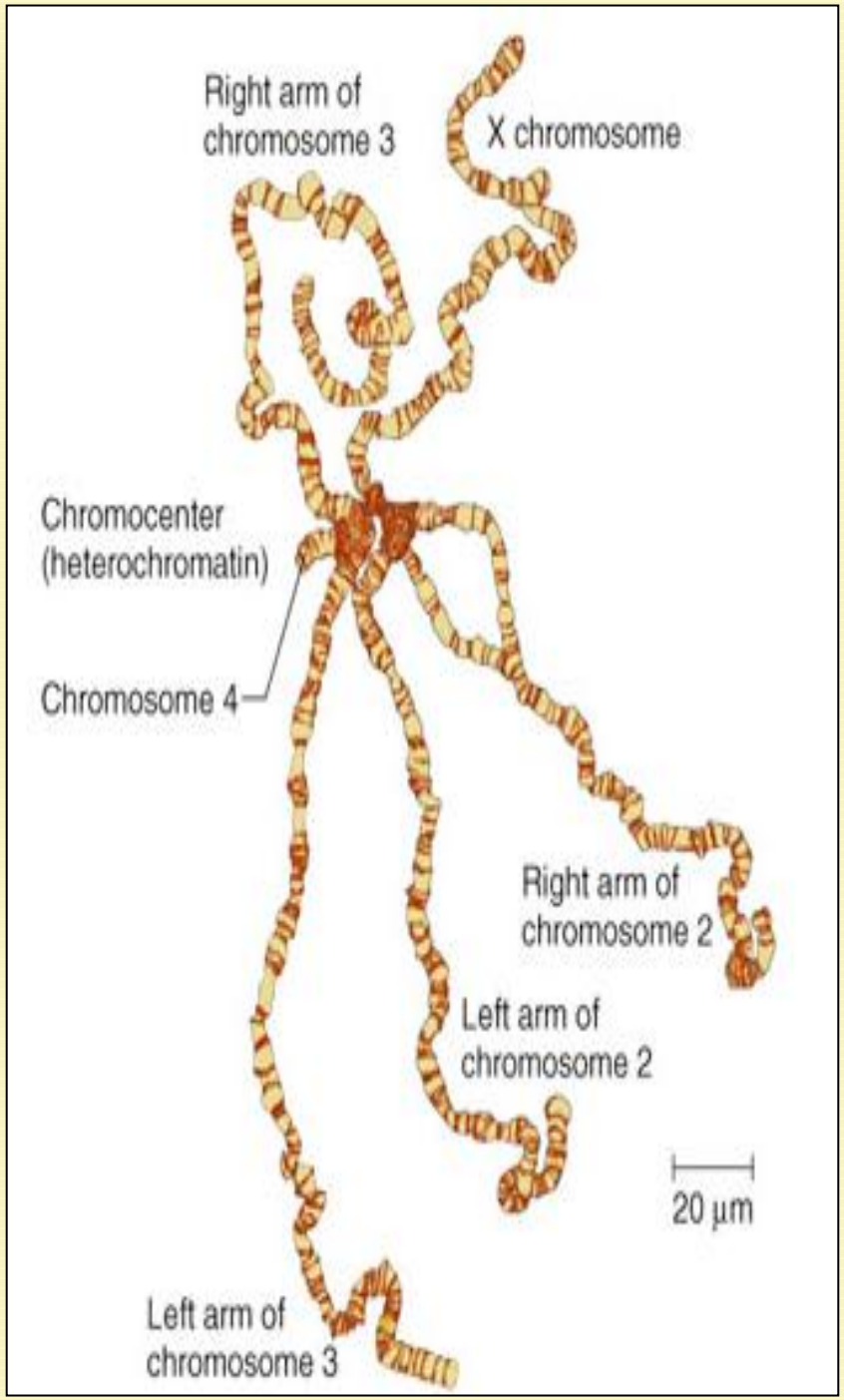


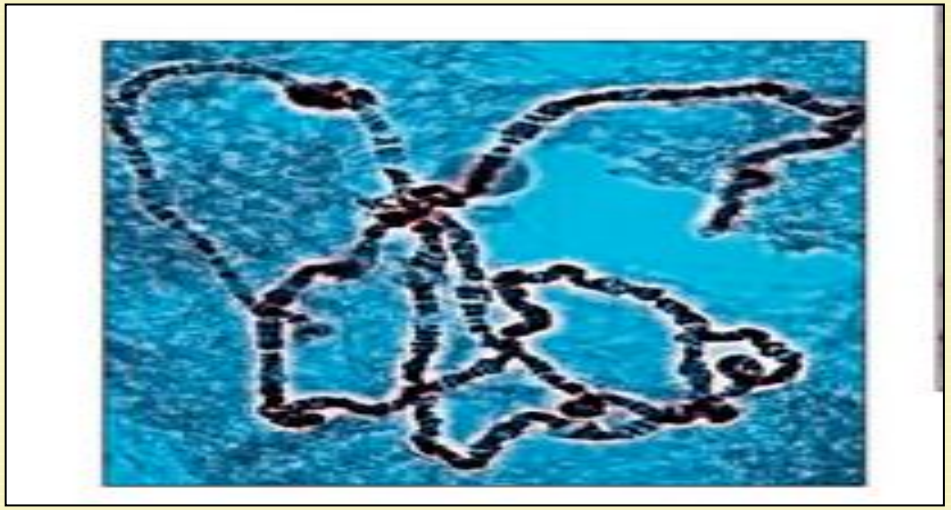







Right arm of chromosome 3
X chromosome
Chromocenter (heterochromatin)
Chromosome 4
Right arm of chromosome 2
Left arm of chromosome 2
20 µm
Left arm of chromosome 3



منيره الدوسري