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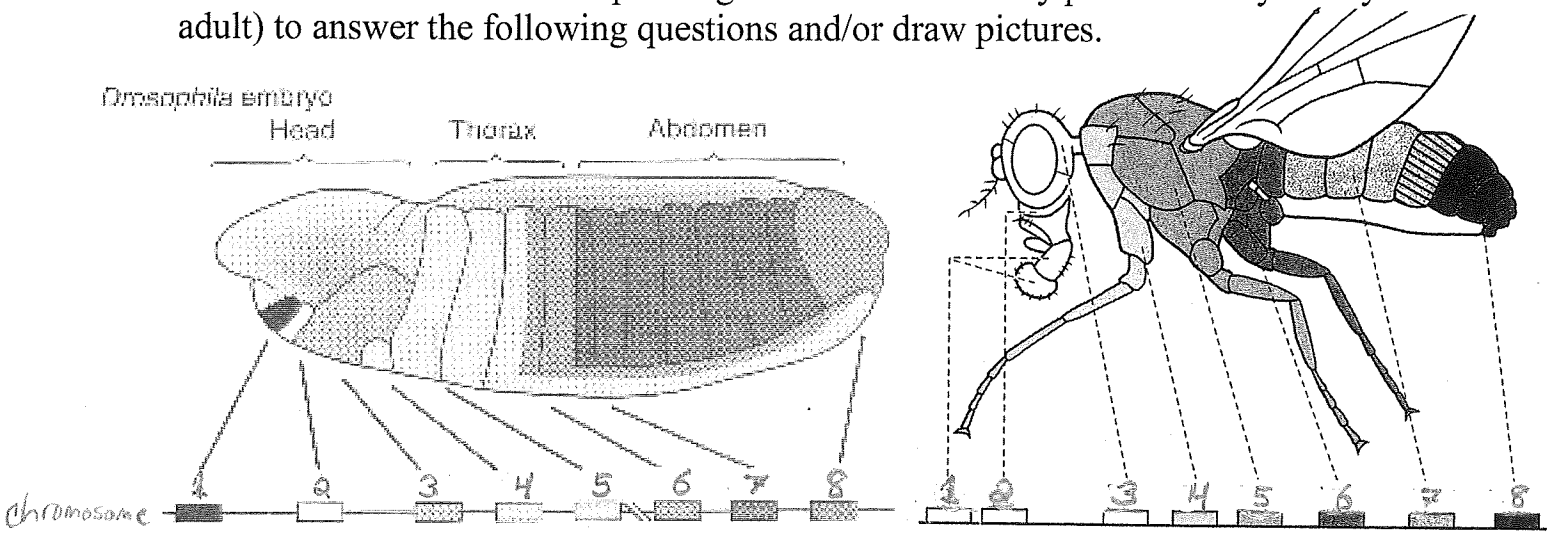
Altering HOX genes in fruit flies activity

- As we have learned in class, there are special genes in all organisms called HOX genes (homeobox genes) that have several functions including controlling the location and growth of body segments.
- Using the diagrams below (which shows the location of specific HOX genes on a chromosome and their corresponding locations in the body plan of the fly embryo and adult) to answer the following questions and/or draw pictures.



Resources: http://atlasgeneticsoncology.org/Indexbychrom/idxa_7.html http://ghr.nlm.nih.gov/handbook/illustrations/chromosomallocation
Carroll, S.B: Endless forms most beautiful, 2005.

1. If mutation in the Hox gene that corresponds to gene "1" on the embryo above, what body segment of the adult fruit fly would be affected?

2. If mutation in the Hox gene that corresponds to gene "4" on the embryo above, what body segment of the adult fruit fly would be affected?

3. If mutation in the Hox gene that corresponds to gene "8" on the embryo above, what body segment of the adult fruit fly would be affected?

4. What would happen if a deletion of the Hox gene that corresponds to gene "4" occurred?

5. What would this **chromosome** with deletion look like?

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6. What would happen if an inversion of Hox genes "5" & "6" occurred?

7. What would this **chromosome** with inversion look like?

8. What would happen if a duplication of Hox genes "5" occurred?

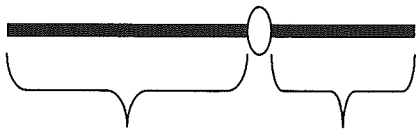
9. What would this **chromosome** with duplication look like?

10. What would happen if a copy of gene "6" were **translocated** next to gene "3"?

11. Why do you think humans have more Hox genes than fruit flies?

* Human **chromosome #7** contains 12 Hox genes linked to growth and differentiation of development of human embryos. This chromosome contains more than 158 million base pairs and represents about 5 % of the total human genome (DNA).

12. Hox gene **HoxA1** is found on the short arm of chromosome #7. Identify arm in the picture below.

chromosome 7 

* HoxA1 is believed to be involved in the placement and development of the hindbrain segments of the human head.

13. Why are scientists studying the HoxA1 gene in relation to Autism in humans?