

Careers in Science

Geneticist

Genetically, humans and fruit flies are similar. They share many of the same genes and, in some cases, use them in the same way. How do we know this? Geneticists work on the cutting edge of science and technology as they study genes, their functions, and their effects. They study not only how genes are inherited but also the role of genes in health, disease, and overall life span.

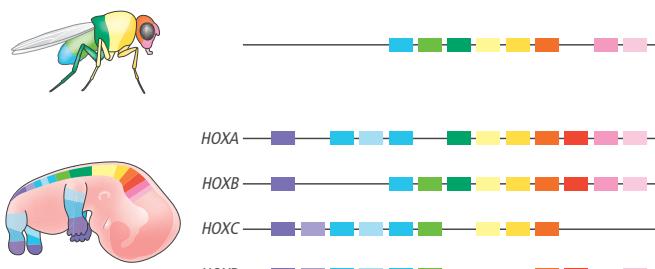
Geneticists use the fruit fly as a model organism for studying genetics. The short life span and small size of the fruit fly, as well as the ease with which they can be grown and maintained in a lab, make them model organisms to study. Most importantly, their entire genome is contained on just four chromosomes. This has allowed researchers to completely map the fruit fly genome.

Many known human disease genes have a recognizable match in the genetic code of the fruit fly. Using a systems approach to research, scientists, including molecular biologists, geneticists, and mathematicians, can use the information gained from studying fruit flies to provide insight into these diseases and many others. This same approach can be used to determine the mechanisms responsible for a number of different birth defects.

Studying fruit flies has led to many important discoveries. Observations of strange mutations in fruit flies, including legs where antennae should be or extra pairs of wings, led geneticists to the discovery of homeobox genes. Further investigation into these strange body modifications led to the finding that most of these changes were caused by mutations in a single set of homeobox genes, called *Hox* genes.

Vertebrates, such as humans, also have *Hox* genes. However, they are a bit more complex. In a fly, each segment of its body expresses only one *Hox* gene. Therefore, a mutation to a single *Hox* gene directly affects the corresponding body segment. In vertebrates, however, each segment has at least two, and up to four, *Hox* genes involved in its development.

FIGURE 11: The genes that determine a fruit fly's body plan are variations of the same genes that determine a human's, but they are expressed in different patterns.



Hox genes have a critical role in the regulation of cell differentiation. Some *Hox* genes also act as tumor suppressors, meaning they help control cell growth and prevent cells from growing or dividing too quickly.



Language Arts Connection

Make an informational career guide for a high school counselor to give to their students. In your guide, include text and media explaining what a job in genetics consists of and describing some of the topics geneticists are currently studying. Gather evidence from several different sources, including articles and scientific journals. Be sure to properly cite your sources in your informational guide. Use these questions to guide your research:

1. What are some of the topics that geneticists are currently studying?
2. What type of training and education is necessary to be a geneticist?
3. What is the importance of this career to society and to future generations?
4. If you were to become a geneticist, what questions would you like to answer through your work?

**TWINS: ARE THEY
EXACTLY THE SAME?**

"JUNK" DNA

**GENES: LIFE
AFTER DEATH**

Go online to choose one of
these other paths.