Model Organism Research Encyclopedia Article

Model Organism Research

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The rapid development genetic technology during the second half of the twentieth century was made possible by meticulous scientific studies on nonhuman organisms and populations. Ethical and practical considerations often prevent the use of human subjects in most basic science research. Accordingly, many of the technologies that have recently allowed the **sequencing** of the human **genome** and the mapping of genes owe a great debt to work done with **species** as phylogenically different as *Drosophilae melanogaster* (a fruit fly), *Escherichia coli* (a **bacteria**), *Saccharomyces cerevisiae* (a **yeast**), and *Mus musculus* (the common laboratory mouse). Each of these species present unique advantages in genetic studies (e.g., rapid generational turnover, etc) and each of these model organisms present workable genomes that are much more easily studied than the human genome. Studies involving such organisms fall under the broad classification of model organism research.

Model organism research is an integral part of modern molecular biology and allows researchers to more easily gather and evaluate data relating to a variety of genetic processes ranging from basic genetic structures and reactions involving **DNA** to the mechanisms of genetic regulation.

There exists a much greater variety in **gene expression** (phenotype) between species that there is difference in the fundamental workings of their genetic mechanisms, especially as related to the fundamental mechanisms of **replication**, **transcription**, and **translation**. Because to this proximity, at the genetic level is often easier to extrapolate and apply findings based upon model organism research to human **genetics**.

The biological similarities between mice and men make **laboratory mouse genetics** especially significant and applicable to human genetics research. Mice and men share many similar sequences of DNA, and many genes have been conserved (remained the same) throughout evolutionary history. Such evolutionary studies are made easier by the ongoing construction of physical maps for both species that will more clearly delineate the similarities and differences between them. Comparisons of the similarities and differences between the genomes will allow more exacting use of mouse data in the search for understanding of human diseases and of the mechanisms of **pharmacogenetics**.