# Nobel Prize for the Fruit Fly

Drosophila melanogaster commonly known as fruit fly [Figure 1] is considered as a pest by farmers as they love to eat ripe fruits, but a friend of researchers because of its short life cycle, inexpensive, easy to breed and produces large numbers of offsprings. Apart from this, the chromosomes are large and can be easily found in saliva thus can be easily observed and studied. Drosophila genome has four pairs of chromosome, have a high rate of mutation and about more than 90% of its homeobox domain of homeotic genes (Antennapedia, Fushi tarazu, and Ultrabithorax) are shared by human. Due to its small genome size, it is easy to understand and map the genome. Max Planck Society reported that about 75% of the genes causing disease in human are found in fruit flies. About 90% of the fruit fly genes can cause cancer in human. Therefore, it is a very useful organism for genetic study.

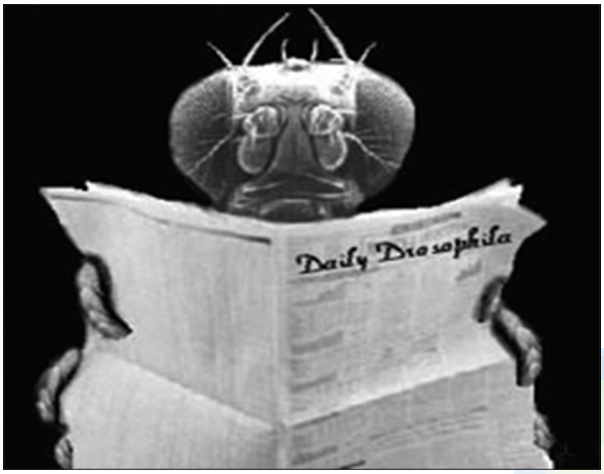


**Figure 1:** The fruit fly.

Till date, five groups have received the Nobel Prize for their work using fruit flies as their model organism.

The studies on fruit flies dated back to the 1900s, when Thomas Morgan [Figure 2] worked on fruit flies and established the

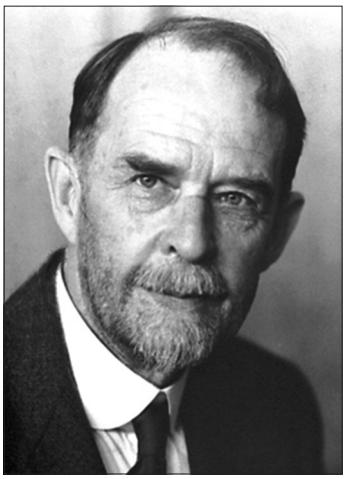

**Figure 2:** Thomas Morgan.

**Figure 3:** H. J. Muller.

**Figure 4:** Edward B. Lewis, Christiane Nusslein Volhard and Eric F. Wieschaus.

**Figure 5:** Bruce Beutler, Jules Hoffmann and Ralph Steinman.

**Figure 6:** Jeffrey C. Hall, Michael Rosbash and Michael W. Young.

chromosomal theory of inheritance further leading to the Nobel Prize for medicine in 1933. His work with Drosophila played an important role in fundamental discoveries of inheritance.

In 1927, Muller [Figure 3] one of the Morgans' students studied the hereditary characteristics of fruit flies and demonstrated that mutations and hereditary changes can be caused by X-ray (Muller 1927). He also observed that higher the X-ray exposer higher was the frequency of mutation. This study became the first evidence of harmful effect of X-ray. Later in 1946, Muller was awarded the Nobel Prize in physiology or medicine for the same.

In the late 1970s and 1980s geneticist, embryologists and molecular biologists started working together, and Drosophila research became a great hit.

Edward B Lewis [Figure 4], along with Christiane Nusslein Volhard and Eric F Wieschaus was awarded the Nobel Prize for physiology or medicine in 1995. The study conducted by these three scientists was on early embryo development. Christiane Nusslein Volhard and Eric F Wieschaus were able to identify genes that were playing an important role in the formation of body segments and body plans in Drosophila. Edward B Lewis studied how the genes were controlling the development of specialized organs from these body segments. This discovery has helped in understanding the congenital malformation in human.[1-8]

This tiny little fly has not only revolutionized the field of genetics but also was a star in the field of immunology. When the scientists were searching an answer to the question that how human and other organisms protect themselves from the attack of bacteria and other organisms. Bruce Beutler [Figure 5], Jules Hoffmann and Ralph Steinman got an answer to it while working on Drosophila.

Jules Hoffmann found that flies with mutations in Toll gene died when infected with bacteria and fungi due to lack of innate defense system, thus throwing light on receptor proteins which can recognize microorganisms and activate innate immunity. Beutler discovered that Toll-like receptors were also present in mice, which shows that mammals and fruit flies have similar kind of molecules to activate innate immunity. Ralph Steinman discovered dendritic cells and their ability to activate T cells. Thus the signal generated by Toll-like receptors is sensed by dendritic cells, which further activates T cells, therefore, it avoids the destruction of body's own molecule. This work was then awarded the Nobel Prize in 2011 for physiology or medicine.

Finally, again this small little creature has played a beautiful role in receiving the 2017 Nobel Prize for Physiology or Medicine. All living organisms have an internal biological clock, which helps us to keep a day and night rhythm, but the mechanism of its work was not known till date. Jeffrey C [Figure 6]. Hall, Michael Rosbash and Michael W. Young were working on fruit fly and are able to explain how the circadian rhythm is working and synchronizing with the Earth's revolutions.

They isolated a gene which encoded a protein during the night but gets degraded during the day, thus maintaining the internal biological clock. With this discovery, Juleen Zierath member of Nobel academy stated that "The winners have raised awareness of the importance of a proper sleep hygiene."

In today's world fruit fly has established a very wonderful career in the field of research. It has played a huge role in understanding not only genetics but also complex issues such as immunology and biological clocks. Probably now, this small little creature is preparing itself to receive the next Nobel Prize.

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