

# Discovery of special stem cells in fruit flies to help study diseases

IISER team says model will come in handy as it shares similarities with humans

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**CHENNAI:** For the first time, researchers have discovered hematopoietic stem cells in *Drosophila* (fruit flies), thus providing an invertebrate model to study hematopoietic stem cells. Hematopoietic stem cells are the stem cells that give rise to all the other blood cells.

Till date there has been no evidence of hematopoietic stem cells in fruit flies and only the progenitor cells, which are precursors to differentiated cells, were found in these flies. The results were published in the journal *eLife*.

Many diseases in humans are linked to the development of blood cells. For instance, leukaemia and Fanconi anaemia take root at an early embryonic stage. But studying how the development of blood cells in humans leads to these diseases has been difficult as the early hematopoietic stem cell development takes place in a six-week-old embryo.

## Embryonic stage

"There are technical difficulties in studying hematopoietic stem cell development in human embryos as it would involve sacrificing the embryos. Also, when we take the hematopoietic stem cells and culture them in a plate, the signal produced might not be identical to the ones produced by cells inside the organism. So we need an animal model to study how this development takes place in the embryo. The fruit fly model comes handy," says Dr. Lolitika Mandal from the Indian Institute of Science



**TOP TEAM:** (From left) Dr. Lolitika Mandal, Nidhi Sharma Dey and Parvathy Ramesh have discovered the hematopoietic stem cells in *Drosophila* (fruit flies). — PHOTO SPECIAL ARRANGEMENT

Education and Research (IISER), Mohali, and the corresponding author of the paper.

"Fruit fly will serve as a good model as it shares many similarities with humans — the signalling pathways and a lot of molecules and processes are common. Also, the way the HSCs [hematopoietic stem cells] are generated and the early process of blood cell development are similar in vertebrates and in fruit flies," says Nidhi Sharma Dey from IISER, Mohali, and the first author of the paper.

Precursor cells that have already been found in the lymph gland (blood-forming organ) of fruit fly larvae give rise to mature blood cells. This led Dr. Mandal and her team to wonder if there are cells that actually give rise to these precursor cells. "This search led us to discover the

hematopoietic stem cells in flies," she says.

## Multipotent cell

Using genetic techniques, the researchers could confirm the presence of a transient, hitherto unknown multipotent cell in the early larval stages of *Drosophila*.

The team went beyond discovering the hematopoietic stem cells that give rise to blood cells to describe the signals that are required for maintaining the status of stem cells. In the absence of signalling, the stem cells would all convert to mature blood cells leaving no stem cells behind.

"The signals that are required to maintain the hematopoietic stem cells in fruit flies are the same as seen in vertebrates, including humans," Dr. Mandal says. The fruit fly model mimics everything of the vertebrates at

the level of genesis as well as maintenance."

In vivo imaging of the fruit fly model will allow researchers to tease out the genetic information required for normal development and the diseased condition. It will now become possible to study the early pathogenesis, which has not been possible so far.

## Ease of access

"While there is only one HSC in vertebrates in the early blood development stage, fruit flies have 4-5 HSCs. Also, there is an easy of access to these HSCs for manipulation in the case of flies," says Ms. Dey.

"Though the concept of stem cell biology was launched from a vertebrate model, the first in vivo evidence of any stem cell has come from the *Drosophila* model," says Dr. Mandal.