

Scientists gain insight into effects of immune cell activity on growth control



New Delhi, June 26: The regulation of growth in animals is a complex process that continues to intrigue and challenge scientists. In order to de-construct the many elements that control growth, powerful biological systems have been developed in laboratories worldwide. The systems of choice must make it possible to modulate cellular and molecular components at different stages of development and track the impact of these, from the earliest stages of formation to an adult, fully grown organism. The fruit fly *Drosophila melanogaster*, has been an invaluable resource in this context, providing many key insights to the controlling element of organ size and organismal growth.

Tina Mukherjee and her group at the Metabolism and Development (MAD) Laboratory at the Department of Biotechnology's Institute for Stem Cell Science & Regenerative Medicine (DBT-inStem), Bengaluru, explored whether changes in immune status or function influence the growth of a whole organism. Immune activity has a high energy demand and can force a systemic redirect of energy utilization from less essential needs to meet the requirements of an immune response to combat infection.

The Metabolism and Development Laboratory at DBT-inStem uses *Drosophila* with a toolbox of genetic tricks that allow manipulations of immune status early in development (in larval life) and follow the consequences of these on growth in adult flies. Blood cells in *Drosophila* function like myeloid cells in mammals and are critical for innate immunity, wound healing, tissue integrity and stress responses. Their development employs similar process and molecular strategies as exhibited in blood development in humans.

Interestingly, *Drosophila* larvae deprived of blood cells grow into small-sized adults and display signs of insulin insensitivity. This was established in an assay where following exposure to a diet with excessive sugars, the animals with reduced blood cells showed evidence of growth retardation. Flipping this idea around, the group examined if increasing the number and activity of cells in the immune system of *Drosophila* had the opposite effect.

Excitingly, their experiments showed that increasing the number and activity of hemocytes – the blood cell type that was of interest – did influence growth outcomes but, with some key differences. While increased immune activity early in development did not change the pattern of growth in any way, the animals with this experience throughout their larval development were able to withstand the detrimental effects of excessive sugar dietary stress as adults.

Altogether, this study, which has been published in *Frontiers in Immunology*, provides an intriguing insight on the nuanced effects of immune cell activity on growth control. While a main focus has been on showing that immune cells balance inflammation and insulin signalling, the work opens up new avenues of investigation on how immune function during development can impact long-term growth of an animal. Whether the immune function - growth control axis also functions in humans and other mammals are exciting directions arising from this work.

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