Can we turn back the clock on an aging thymus?

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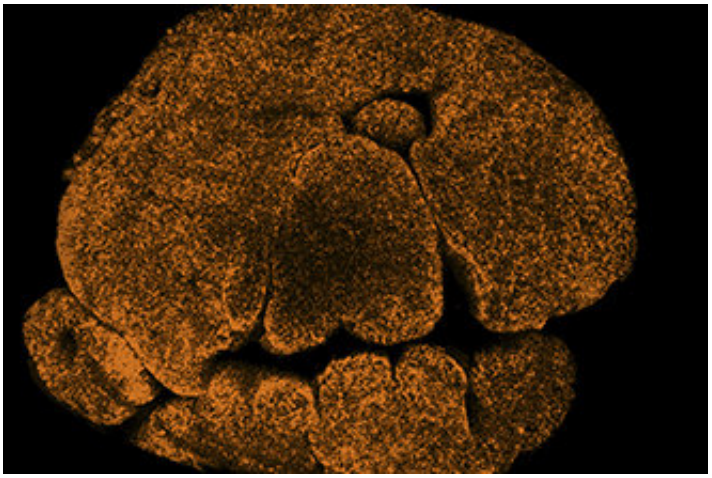

Credit: Walter and Eliza Hall Institute of Medical Research

As we age our thymus shrinks and is replaced by fatty tissue, losing its essential ability to grow and develop T cells and leaving us susceptible to infections, immune disorders and cancers.

Institute scientists have identified a cell that they believe is involved in the curious disappearance of our thymus; and could be the key to regenerating this vital organ.

The aging thymus

The thymus is a little organ that sits behind the collarbone, but it

performs an important job. The thymus is where essential immune cells called T cells are made and trained to go out into the body and fight infections and cancer.

A peculiar feature of the thymus is that it disappears as we get older. The thymus starts deteriorating after birth but the process speeds up after puberty and, by age 65, we are basically unable to make new T cells.

As the organ shrinks, the T cell areas are replaced with fatty tissue, in a process called involution. As it is replaced by fatty tissue, the thymus can't perform the same immune functions.

New insight into how the thymus disappears

Dr. Daniel Gray and Dr. Julie Sheridan have identified a type of stromal cell that might be involved in the shrinking and degeneration that happens to the thymus. The research was published in *Cell Reports*.

Dr. Sheridan said stromal cells were the 'forgotten child' of the thymus.

"As your thymus ages and degnerates, it becomes a sea of fatty cells and tissue, with only small pockets of T cells.

"We have identified a stromal progenitor cell – which is capable of becoming one of several types of cells – in the thymus that readily turns into fat cells," Dr. Sheridan said.

"We think this cell probably plays an important role in the process of thymus involution – replacing healthy, functioning immune tissue with fat as we age."

Turning back the thymus clock

Dr. Gray said unlocking the secrets of thymus involution – and how it could be reversed – was important in efforts to turn back the clock to treat disease.

Regenerating the thymus could allow us to boost the immune system of older people so they can better fight infections, help people who have bone marrow transplants or cancer treatments to replenish their immune system,and treat people with rare disorders such as primary immunodeficiencies.

"Degeneration or 'involution' of the thymus can have really serious consequences as we age," Dr. Gray said.

"It explains in part why elderly people have so much trouble fighting infections, such as the flu."

"It also explains why adults who have depleted immune systems, for example due to cancer treatment or stem cell transplants, take years to recover their T cells – and sometimes never do. These people are, for the rest of their lives, at higher risk of infection and cancer.

"With this research, we are building a picture of how and why the thymus degenerates so that we could find ways to stop or reverse the process to treat infections, cancers and immunodeficiencies," he said.

More information: Julie M. Sheridan et al. Thymospheres Are Formed by Mesenchymal Cells with the Potential to Generate Adipocytes, but Not Epithelial Cells, *Cell Reports* (2017). DOI: 10.1016/j.celrep.2017.09.090

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