T cells and aging: Unraveling the complexities of lifespan

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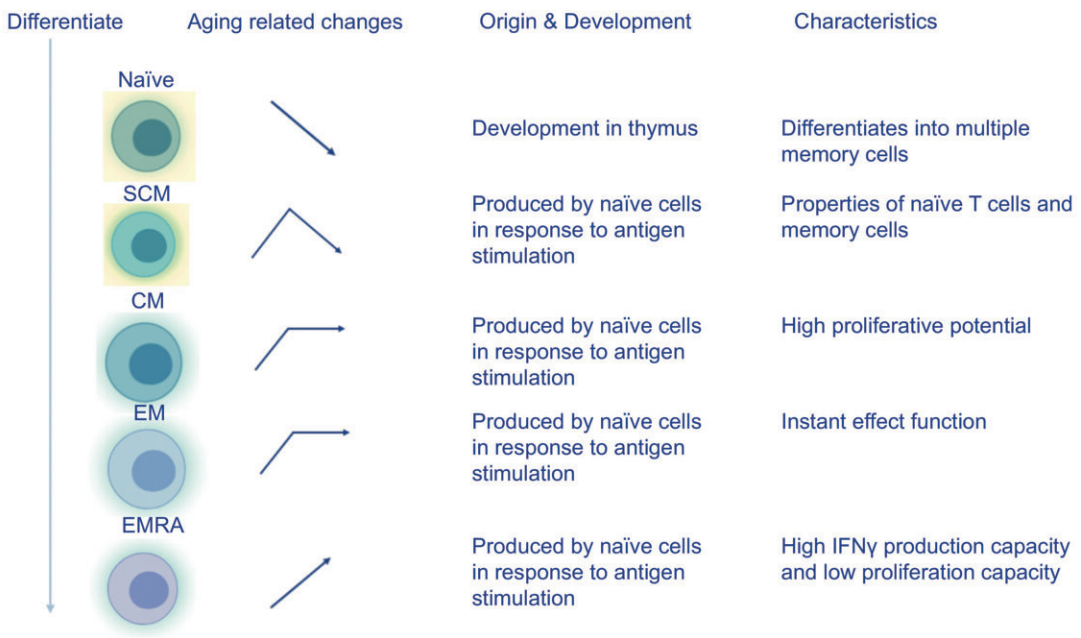

Linear differentiation characteristics of T cells in peripheral circulation and changes with aging. SCM: stem cell memory T cells; CM: central memory T cells; EM: effector memory T cells; EMRA: effector memory CD45RA T cells. Credit: *Aging Research* (2024). DOI: 10.26599/AGR.2024.9340021

Aging significantly impacts the immune system, notably through the involution of the thymus, which reduces T cell production. This decline weakens immune responses, making older adults more susceptible to infections and diseases. Aged T cells also exhibit reduced recognition

and responsiveness to antigens, impairing immune surveillance and memory.

The thymus, essential for T cell maturation, undergoes structural and functional changes over time, further diminishing immune function. Due to these issues, there is an urgent need for in-depth research to explore strategies for enhancing immune function in the elderly.

Researchers from Jinan University and Johns Hopkins University, led by Xiao Sean Leng, published their findings in *Aging Research*. The study delves into T cell development and aging, focusing on thymus development, T cell subset differentiation, and their implications for immune health in older adults.

The study provides an in-depth analysis of T cell development, beginning with their migration from bone marrow to the thymus, where they undergo critical selection and maturation processes. It highlights the differentiation of various T cell subsets, including conventional naïve T cells, regulatory T cells, effector T cells, and memory subsets, as well as unique subsets like γδ T cells, MAIT cells, and NKT cells.

The research emphasizes the vital roles these subsets play in maintaining immune function, particularly in older adults. The study also explores the impact of thymic involution on T cell functionality, demonstrating that aged T cells exhibit reduced antigen responsiveness and result in increased susceptibility to infections and cancers in older adults. Additionally, it suggests potential strategies to address the challenges in studying T cell development and aging, aiming to enhance immune function and resilience in the elderly.

Dr. Xiao Sean Leng, the lead researcher, states, "Our study sheds light on the intricate processes of T cell development and aging. Understanding these mechanisms is crucial for developing strategies to

enhance immune function in older adults, potentially improving their healthspan and resilience against diseases."

The findings underscore the need for innovative approaches to boost immune function in the elderly. Potential strategies include enhancing thymus function, promoting T cell regeneration, and developing targeted therapies to improve T cell responses. This research paves the way for future studies aimed at mitigating the effects of aging on the immune system, ultimately contributing to better health outcomes for older adults.

More information: Lipeng Mao et al, Human T cell development and aging: Remodeling throughout the lifespan, *Aging Research* (2024). DOI: 10.26599/AGR.2024.9340021

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