

On the Immunological Theory of Aging

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Abstract

Aging is a complex phenomenon the cause of which is not fully understood, despite the plethora of theories proposed to explain it. As we age, changes in essentially all physiological functions, including immunity, are apparent. Immune responses decrease with aging, contributing to the increased incidence of different chronic diseases with an inflammatory component (sometimes referred to as 'inflamm-aging'). It is clear from many studies that human longevity may be influenced by these changes in the immune system, but how they proceed is not clearly determined. In this chapter, we will review the age-related changes in the immune response and assess the validity of the immune theory of aging (i.e. that these changes in immune response are the primary cause of aging). Many data in humans support the notion that age-associated immune dysfunction may at least in part explain the aging process. Explanatory power may be enhanced by combination with other theories such as the free radical theory. More longitudinal studies are needed to corroborate the immune theory of aging.

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One of the most important questions in life is why we age and why it ends. Most of the living organisms on earth are subject to this universal phenomenon, although at grossly differing rates, and most of our knowledge originates from mammalian studies. Another universal phenomenon of life is that each organism must possess the means to protect itself from external and internal challenges to maintain its integrity, i.e. must possess an immune system, different as this may be in different organisms [1]. Powerful defenses must be carefully focused on the target to limit self-injury, as inevitably occurs to some degree during immune reactions (immunopathology). Does this mean that as well as contributing to longevity by protecting against disease, the immune system may damage healthy tissue and contribute to the ageing process,

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