

Chapter 16

Dietary Supplements Functions as Improved Immunity in Nutritional Deficiency Autoimmune Disorders Considerations: Mycobacterium Tuberculosis Induced RA With LCPUFA– DHA in Mice

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ABSTRACT

The immune system is highly toned and efficiently dedicated to maintaining health by protecting against a tremendous array of invaders. A possible explanation may be that mice with the mycobacterium tuberculosis induced rheumatoid arthritis may be better primed for improved n-3-LCPUFA utilization due to their prior deficiency status. The authors showed that EPA/DHA supplementation in mice with sufficient n-3-PUFA status did not interfere with the TB drug treatment when co-administered as an adjunct therapy. A similar trend was observed when mice with low n-3-PUFA

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status were supplemented with EPA/DHA, suggesting that the coadministration of EPA/DHA together with the currently used TB antibiotics has no observable adverse effects. Abnormal bone remodeling destroys the microstructure of subchondral bone which results in articular cartilage degeneration. It was investigated that DHA was able to protect articular cartilage by preserving the microstructure of subchondral bone. Activation of Wnt/ β catenin pathway promotes differentiation into osteoclasts, promoting osteoblast proliferation.

1. INTRODUCTION TO NUTRITION AND CORRELATION WITH AUTOIMMUNE DISEASES (AD)

Nutrition and immunity are closely related, and the immune system is composed of the most highly energy-consuming cells in the body. Much of the immune system is located within the GI tract, since it must deal with the huge antigenic load introduced with food. Moreover, the incidence of immune-mediated diseases is elevated in Westernized countries, where “transition nutrition” prevails, owing to the shift from traditional dietary patterns towards Westernized patterns. This ecological correlation has fostered increasing attempts to find evidence to support nutritional interventions aimed at managing and reducing the risk of immune-mediated diseases. Recent studies have described the impacts of single nutrients on markers of immune function, but the knowledge currently available is not sufficient to demonstrate the impact of specific dietary patterns on immune-mediated clinical disease endpoints. If nutritional scientists are to conduct quality research, one of many challenges facing them, in studying the complex interactions between the immune system and diet, is to develop improved tools for investigating eating habits in the context of immunomediated diseases. Moreover, it was recently reported that eicosapentaenoic acid (EPA), an n-3 polyunsaturated fatty acid (n-3 PUFA), increased mycobacterial growth by reducing TNF α secretion in macrophages. However, the role of distinct classes of long chain dietary fatty acids during TB infection has not been well investigated to date. Dietary n-3 PUFA are found in cold water fish and fish oils and their effect on immune responses has been studied extensively. The anti-inflammatory properties of n-3 PUFA make them useful as a therapy for chronic inflammatory diseases, autoimmune disorders and cancer. However, epidemiological studies have linked n-3 PUFA-enriched diets not only with a reduced incidence of inflammatory diseases but also with an increased incidence of TB. We previously aerosol challenged transgenic fat-1 mice, which endogenously produce n-3 PUFA, and fish oilfed guinea pigs with H37Rv Mtb and bacteriological and histological analysis revealed that n-3 enrichment enhances susceptibility to TB infection, as

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