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Short Communication

Biotherapy and the Immune System in Ageing Science

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Abstract

Nutritional interventions have become important to delay the global diabetes and non-alcoholic fatty liver disease (NAFLD) pandemic. Nutritional biotherapy that activates the heat shock gene Sirtuin 1 (Sirt 1) is essential to prevent immunosenescence that is connected to mitochondrial apoptosis, chronic disease and neurodegeneration. Biotherapy to maintain the immune system require interventions that increase the consumption of Sirt 1 activators, functional foods and bioactive molecules. Low calorie diets are essential to maintain the Sirt 1 regulation of the immune system and autoimmune disease. Plasma Sirt 1 analysis should now be conducted on plasma samples to determine Sirt 1's role in the defective immune system/autoimmune disease with relevance to diabetes and NAFLD. Sirt 1 analysis with other immunological tests may assist with interpretations relevant to mitochondrial apoptosis and immunological disease. Drugs and immune reactions that regulate immune cell function are now linked to Sirt 1 activation with relevance to hepatic caffeine, xenobiotic and drug metabolism.

Keywords: Biotherapy; Immune System; Chronic Disease; Food Quality; Sirtuin 1; Immunosenescence

Immune competence changes over a human's life span with a process known as immunosenescence [1,2]. In man multiple theories of aging have been proposed [3] with the immune theory of aging that involve abnormal inflammatory responses that contribute to the induction of chronic diseases [4]. Autoimmune disease and immunosenescence are related to the chronic disease epidemic with uncontrolled release of inflammatory cytokines [5] such as tumor necrosis factor α and interleukin-6. Major interests to determine human longevity require the assessment of nutrition and diet [6] with relevance to the control of inflammatory cytokines that are associated with age-related changes in the immune system [3] and the induction of diabetes, non-alcoholic fatty liver disease (NAFLD) and neurodegeneration.

An association between various genes and the immune system has been proposed to be involved with the regulation of lifespan in various species [7]. Immune gene activation has been associated with brain aging with the critical involvement of inflammation in the development of neurodegeneration [8]. The discovery of the heat shock gene Sirtuin 1 (Sirt 1) now has become of importance to human longevity [9,10] with its relevance to autoimmune disease, diabetes, NAFLD and accelerated brain aging [11-13]. Sirt 1 is a nicotinamide adenine dinucleotide (NAD+) dependent class III histone deacetylase (HDAC) involved in immunosenescence [14] and targets transcription factors to adapt immune responses to metabolic activity and insulin resistance.

Sirt 1 plays an important role in B cell antibody response and T cell tolerance with relevance to autoimmune and chronic disease [14]. Sirt 1 is involved with deacetylation of the p53 transcription factor that is associated with the immune response and mitochondrial apoptosis [11] that is critical to the regulation of Sirt 1/p53 immunometabolism and determines the adipose tissue release of adipocytokins involved in the induction of global NAFLD [12]. Sirt 1 regulates the immune response/autoimmune response [15-17] with the recent identification of a novel Sirt 1 mutation linked to autoimmune disease [18]. Sirt 1 is critical to the maintenance of the heat shock protein 70 (HSP 70) metabolism that is involved in the regulation of the immune system and programmed cell death [9-14]. Sirt 1 and its regulation of nitric oxide homeostasis is linked to the immune system, antimicrobial activity and mitochondrial apoptosis [14].

In the developed and developing world nutritional interventions have become important to delay the global diabetes and NAFLD pandemic. Food and nutritional guidelines are required to activate and maintain the Sirt 1 gene [19-24] to prevent immunosenescence connected to mitochondrial apoptosis, chronic disease and neurodegeneration [19-24]. Nutritional biotherapy (Figure 1) is now critical to maintain the immune system [25] with interventions to increase the consumption of Sirt 1 activators and reduce the consumption of Sirt 1 inhibitors [26]. Sirt 1 activators such as magnesium, zinc, rutin, alpha-lipoic acid, resveratrol and

leucine are essential to maintain the immune system [27-31] with functional foods and bioactive molecules under assessment [20]. Sirt 1 inhibitors such as sirtinol, suramin, palmitic acid, alcohol, butyric acid (high doses), nitric oxide foods, patulin, arginine (high doses) and bacterial lipopolysaccharides should be assessed to delay disease progression. Food quality assessment that reduces LPS and mycotoxin prevents Sirt 1 repression [32] with low calorie diets essential to maintain Sirt 1 regulation of the immune system. Relevance of caffeine intake to the immune system [33] has become of importance to modulate the immune system with food intake related to Sirt 1 activation and the prevention of caffeine induced mitochondrial apoptosis [34,35].

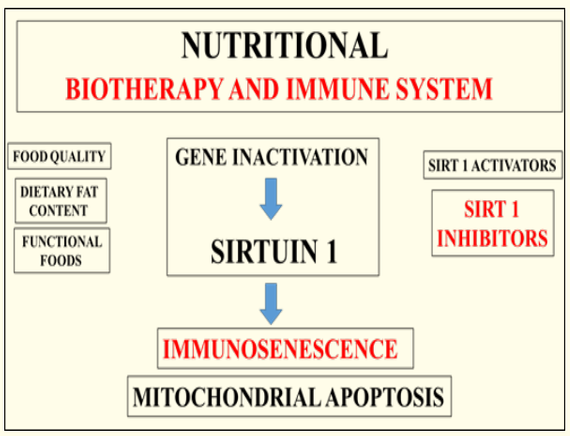

Figure 1: Nutritional biotherapy and immunosenescence are linked to the global diabetes and NAFLD epidemic. Inactivation of the heat shock gene Sirt 1 is related to elevated HSP 70 levels and the induction of mitochondrial apoptosis and the defective immune system. Food quality and functional foods are required to maintain the immune system and prevent insulin resistance associated with the reversal of global diabetes and NAFLD.

Plasma Sirt 1 analysis [36-40] should be conducted to determine Sirt 1 inactivation with relevance to defective immune system and autoimmune disease [15-17]. Other tests such as whole blood count, inflammatory markers (cytokines) and autoantibodies may assist with interpretations from Sirt 1 analysis with relevance to mitochondrial biogenesis [37], mitochondrial apoptosis and immunological disease [41]. Drug metabolism is important to the immune system with several drugs under testing that may induce hypersensitivity immune reactions [42] that involve immune cell function [43]. Interest in Sirt 1 and drug metabolism [40,44] has become important with Sirt 1 now linked to hepatic caffeine, xenobiotic and drug metabolism [45].

Conclusion

The identification of genes involved in the regulation of immunosenescence has become important to the survival of various species. Activation of immune genes in the brain and the periphery are important to inflammation and to the prevention of accelerated brain aging, NAFLD and diabetes. The heat shock gene Sirt 1 alters transcription factors to regulate the immune response with and HSP 70 metabolism linked to autoimmune disease and programmed cell death in the brain and periphery. Nutritional biotherapy is essential to maintain Sirt 1and hepatic drug metabolism with consumption of Sirt 1 activators necessary to maintain the immune system and to prevent drug induced immune reactions relevant to the global chronic disease.

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