International Journal of Medical Science and Clinical Invention 8(5): 5359-5363, 2021
DOI:10.18535/ijmsci/v8i05.01
e-ISSN:2348-991X, p-ISSN: 2454-9576

Research Article,

Effect of the Protein Cunsumption Over the Immune System Responses Given During Covid-19

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Abstract:
It has long been known that insufficient intake of quality dietary protein or amino acids impairs immune function and increases susceptibility to infectious diseases Nutritional status in people infected with SARS-CoV-2 is a crucial factor for optimal prognosis and can determine the clinical severity of COVID-19. Insufficient energy and protein intake to reduce weight gain due to inactivity during the pandemic is a common mistake people make. Insufficient intakes of energy, protein and specific micronutrients; It is associated with suppressed immune function and increased susceptibility to infection.
The morbidity and mortality of the disease is higher, especially in low immune function people. It is known that increasing protein intake is a priority in order to reduce catabolism due to inflammatory mediators
Eating healthy before, during and after the illness is the main key to the immune system and health. Patients who can eat during illness should be advised to consume sufficient and high quality protein despite the loss of their sense of taste. In order to prevent muscle loss and strengthen respiratory muscles, 1.5 g / kg / day protein and branched chain amino acid would be a good decision for this pandemic periods.

Keywords: Immune system, Protein consumption, Covid-19.

Interoduction:
SARS-CoV-2, the part of COVID-19, shares 79% sequence identity with the SARS-CoV virus that caused a major epidemic in 2002-2003 (1). The symptoms of COVID-19 are not specific, and these symptoms have spread to a wide range, from asymptomatic to severe pneumonia and death (2). The most common symptoms reported are fever, cough or chest tightness and dyspnoea. The course of the disease depends on the response of the immune system (1).
The immune system is divided into two as innate and acquired immune systems (3). Innate immune system; It is the immune system that recognizes the early signs of infection and uses rapidly responding receptors to limit spread and encourage adaptive immune responses (4). The innate immune system consists of two general lines of defense. When microorganisms are exposed to the epithelial tissue of our skin, respiratory tract, gastrointestinal tract and mucous membranes in the urogenital tract, they encounter the first line of resistance. The second stage of defense is; It includes chemical signals, antimicrobial peptides, antifagocytic and natural killer cells, and fever associated with the response to inflammation (3). Active or acquired immunity occurs through exposure to a specific antigen or transfer of protective antibodies against the antigen, and in addition, when the same agent is encountered again at another time, the immune system can usually react within hours, thanks to the presence of memory B and T lymphocytes. Specific or acquired immunity develops over the lifetime of the individual. It distinguishes between what belongs to the organism and what does not, and responds specifically to different pathogens and foreign molecules (3). Since COVID-19 is a newly identified pathogen, there is no known immunity to the disease and progresses more severely in people whose immune system is unable to respond rapidly and strongly (5).
It has long been known that insufficient intake of quality dietary protein or amino acids impairs

immune function and increases susceptibility to infectious diseases (6).

Optimal nutrition and quality protein consumption; It affects the antioxidant defense system, gene expression, cell activation and modification of signal molecules, thus the immune system (7).

Nutritional status in people infected with SARS-CoV-2 is a crucial factor for optimal prognosis and can determine the clinical severity of COVID-19. Insufficient energy and protein intake to reduce weight gain due to inactivity during the pandemic is a common mistake people make. Insufficient intakes of energy, protein and specific micronutrients; It is associated with suppressed immune function and increased susceptibility to infection (8). In their nutritional recommendations during COVİD-19 quarantine, Muscogiuri and colleagues (9) emphasized the role of serotonin, which accelerates the healing process, and tryptophan, a precursor to serotonin. In addition, they recommended consuming protein-rich foods such as milk, yogurt, seeds, and nuts. Besides these, some amino acids such as arginine and glutamine also modulate the immune system (10).

Protein Intake for a Strong Immune System:

In the case of a COVID-19 outbreak, quarantine stress leads to sleep disturbances. In this case, it makes stress worse and increases food intake. Thus, a dangerous vicious circle occurs. Therefore, it's important to consume foods that contain or stimulate the synthesis of serotonin and melatonin at dinner time. A wide variety of plant species, including roots, leaves, fruits and seeds such as almonds, bananas, cherries and oats, contain tryptophan, a precursor to serotonin and melatonin. Protein foods such as milk and dairy products are good sources of tryptophan, the sleep-inducing amino acid. In addition, tryptophan mainly reduces carbohydrate and fat intake, inhibits neuropeptide Y, and plays a role in the regulation of satiety and calorie intake. In addition, dairy products such as yogurt can increase natural killer cell activity and reduce the risk of respiratory infections (9).

The morbidity and mortality of the disease is higher, especially in elderly patients with low immune function, people with nutritional deficiencies and people with chronic diseases (11). It is known that increasing protein intake is a priority in order to reduce catabolism due to inflammatory mediators. It is recommended to increase the branched chain amino acid supplementation to 50% or increase the protein intake up to 1.3 g/kg/day to prevent muscle loss, increase the strength of respiratory muscles (12).

It is known that a diet with a low protein content can be harmful in fighting infection (13). Chan J et al. (14) reported that mice fed a 2% protein diet versus a 20% protein diet died rapidly after exposure to M. tuberculosis. This situation is thought to be associated with decreased expression of IF-γ, TNF-α and iNOS (14). In another study, mice consuming very low protein (2% of energy) had a low antibody response, hyper-inflammation and associated increased mortality (15). Interestingly, these effects reverse rapidly within 2 weeks of changing the diet (13).

It is well known that when the protein intake recommended by the RDA falls below 0.8 g/kg/day, the risk of infection increases (13). It is believed that insufficient protein intake causes a decrease in the amount of immunoglobulins involved in the gut-mucosal defense and the amount of gut-associated lymphoid tissue (GALT) (10,13). In addition, protein deficiency is related to changes in antibody production that cause decreased immunoglobulin synthesis and thymus and lymphocyte dysfunction. In addition, a decrease in the rate of CD4 + / CD8 + was observed in the case of protein malnutrition, accompanied by micronutrient deficiency (16).

High Biological Quality Protein:

Post-meal lipogenesis and inflammation may be lower when healthy protein options with high biological value, such as eggs, fish, lean meat, and whey protein, are eaten with meals (17). High-quality proteins are important components of an anti-inflammatory, cardioprotective diet (13,17). It is known that consuming protein with high biological value is crucial for optimal antibody production (6,13,17). Even though the prevalence of protein energy malnutrition (PEM) is low in Westernized countries, some protein sources from foods such as processed meat and cheese are also high in calories and saturated fat. Saturated fats, on the other hand, trigger lipogenesis and inflammation (13).

Amino Acids and Immune Response:

Amino acids are essential for the synthesis of a variety of specific proteins. In addition, it regulates key metabolic pathways of the immune response against infectious pathogens. Arginine, glutamine, and cysteine precursors are currently the best prototypes. In order to maintain a normal immune response and protect the host from various diseases, it is necessary to provide adequate amounts of all amino acids with the diet. Findings obtained from recent studies amino acids in immune responses; activation of T lymphocytes, B lymphocytes, natural killer cells and macrophages; cellular redox status, gene expression and lymphocyte proliferation; ıt shows that play an important role by regulating the production of antibodies, cytokines and other cytotoxic substances (6).

The inflammatory process affects protein metabolism, and most of these effects are regulated by proinflammatory cytokines. Proinflammatory cytokines interleukin (IL) -1b, IL-6 and TNF- have widespread metabolic effects such as negative nitrogen, sulfur and mineral balance. Muscle protein is catabolized to provide amino acids to synthesize new cells, glutathione and proteins for the immune response. Additionally, amino acids are converted into glucose (a preferred fuel with glutamine for the immune system). As a result of this catabolic process, an increase in urinary nitrogen and sulfur excretion occurs (18).

In the case of COVID-19, as in other acute diseases, the catabolic process continues, so normal protein intake is not sufficient to support healing. Increasing the levels of specific amino acids that reduce acute stress, such as cysteine, arginine, and glutamine, increases immunity in such patients (19). These featured amino acids, which act as signal molecules and mediators at the cellular level, are known to regulate many functions in the cell and aid recovery (20).

The branched chain amino acids (BCAA) consist of L-Leucine, L-Isoleucine and L-Valine and have strong anabolic / anti-catabolic properties when consumed (21). BCAAs can preserve villous morphology and increase intestinal immunoglobulin levels. In this way, they strengthen the intestinal barrier and response (13).

Glutamine:

Glutamine is the most abundant amino acid in the human body protein pool (19). It is an important source of energy for many cells, including cells that produce immune responses. It also acts as a precursor for the nucleotide synthesis required for rapidly dividing cells such as immune cells, especially during the immune response. During infection, the rate of glutamine consumption by immune cells is equivalent to or greater than that of glucose (21). Nutritional supplements such as L-Glutamine strengthen the immune system, especially by inhibiting inflammatory responses. In a study (19), COVID-19 patients using L-Glutamine (n: 30) and not using (n: 30) with similar age, gender and clinical condition were followed. The results of the study suggest that the addition of enteral L-glutamine to the normal diet in the early period of COVID-19 infection may lead to a shortened hospital stay and a decrease in the need for an intensive care unit (ICU). Larger studies are needed to evaluate the effect of adding enteral L-Glutamine to current treatments, especially in infectious diseases such as COVID-19 (19). In the immune system, glutamine plays an important role in controlling the proliferation of cells such as lymphocytes, neutrophils and macrophages, activating proteins involved in signal transduction such as ERK and JNK kinases. Both can activate a number of transcription factors, including JNK and AP-1, and eventually promote the transcription of genes involved in cell proliferation (13).

Depletion of glutamine reduces lymphocyte proliferation, impairs the expression and production of surface activation proteins on cytokines, and induces apoptosis in these cells (14). The survival, proliferation and function of immune cells largely depends on the presence of glutamine. In some catabolic cases and/or where glutamine in the diet is insufficient, amino acid support may be required. But the available information on the frequency of nutritional intervention, optimal doses depending on the state of illness or stress, other combinations of amino acids or dipeptides, administration of glutamine is insufficient. In addition, although glutamine requirement increases under catabolic conditions, glutamine deficiency does not occur in all individuals. Therefore, glutamine supplements are not required in all patients (22).

Arginine:

Arginine is an amino acid found in the body as a component of most proteins and as a substrate for some non-protein nitrogen-containing compounds. It is reported that the presence of arginine is essential for T-cell proliferation and function (23). Arginine has been shown to reduce the inflammatory response and rate of infection in critical diseases. In a meta-analysis evaluating the effect of L-arginine supplementation on immune functions, L-arginine was found to cause a significant increase in CD4 + T-cell proliferation and reduce the incidence of infectious complications (24).

Results:

Eating healthy before, during and after the illness is the main key to the immune system and health. Patients who can eat during illness should be advised to consume sufficient and high quality protein despite the loss of their sense of taste. In patients who cannot eat, enteral / parenteral nutrition formulas rich in protein and poor in glucose are given. In critically ill patients, the need for protein is higher due to protein catabolism caused by inflammatory mediators. In order to prevent muscle loss and strengthen respiratory muscles, 1.5 g / kg / day protein and branched chain amino acid would be a good decision.

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