

## A Brief Note on Immuno Nutrition

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### Description

Nutritional immunology is a branch of immunology that studies the impact of food on the immune system and its defence mechanisms. Studying the probable effects of food on the prevention and management of autoimmune disorders, chronic illnesses, allergies, cancer (affluent diseases), and infectious diseases is a part of nutritional immunology. Malnutrition, malabsorption, and nutritional metabolic diseases, as well as the assessment of associated immunological products, are other subjects in nutritional immunology. The importance of nutrition for disease prevention and management many autoimmune illnesses are poorly understood in terms of their onset and course. The "Western pattern diet" includes high-fat, high-sugar, low-fiber meals, as well as an abundance of salt and highly processed foods, all of which are pro-inflammatory. These effects might increase Th1- and Th17-biased immunity, as well as change monocyte and neutrophil migration from the bone marrow. A balanced diet provides a variety of micronutrients with anti-inflammatory and immune-boosting properties that can aid in the prevention and treatment of autoimmune illnesses.

### Macronutrients

Macronutrients are a type of nutrient that the human body need in bigger quantities to operate effectively, and they are divided into three categories: Proteins, carbs, and fats (lipids). Macronutrients' primary job, aside from ensuring that the body operates properly, is to give energy in the form of calories [1].

### Proteins

Proteins are large macromolecules made up of chains of amino acids, the chemical components that enable the majority of biological operations. Proteins are found in meals such as meat, fish, dairy products, eggs, seeds and nuts, as well as beans and legumes, and are present naturally in the body. Proteins can be found in hair, nails, muscles, and bones throughout the body, and they can also act as enzymes and/or hormones. Proteins' activity as enzymes and/or hormones is critical for cell function and even fundamental physiological processes like proliferation. Proteins help muscular development, metabolism, and blood

pressure control. Proteins play an important role in the function, structure, and control of the body's tissues and organs.

Antibodies, y-shaped proteins that bind to viral, bacterial, and parasitic diseases and alert the rest of the body that there is a foreign cell that has to be killed, safeguard the immune system. The body would be unable to recognise and fight infection without antibodies [2].

### Carbohydrates

Sugars, starches, and fibers are carbohydrate compounds found in grains, fruits, dairy products, and vegetables. Carbohydrates are carbon, hydrogen, and oxygen-based organic molecules. They aid the immune system by regulating blood sugar levels, which decreases the body's stress reaction. People frequently ingest carbohydrate-rich foods before working exercise in order to preserve energy and avoid a post-workout breakdown; this is a beneficial effect of blood sugar control. Carbohydrates provide energy to cells, serve as cell receptors for recognition, and aid in cell maintenance.

### Fats (Lipids)

Lipids are hydrocarbon-based macromolecules that come in three different types: triglycerides, phospholipids, and steroids. Because lipids are hydrophobic molecules, they can only be dissolved in non-polar solvents. As a result, lipids cannot be broken down in the body without the help of lipase enzymes, which convert lipids to glycerol and fatty acids. Oils, dairy products, and certain meats, as well as avocados and nuts, contain lipids. Cholesterol is a lipid that plays a crucial role in the regulation of immune cell plasticity in plasma membranes. Lipids are key signalling molecules that help to maintain the integrity of cell membranes, operate as energy stores, and help to maintain body temperature and homeostasis [3].

Human cells would not be able to operate or live without lipids. While eating too much lipids can contribute to obesity, high cholesterol, type 2 diabetes, and other disorders, they are a necessary molecule for the body to ingest and maintain. Vitamins A, K, D, and E, for example, only dissolve in fats and are essential for transporting and metabolizing fatty acids, moving molecules across membranes, and activating enzymes involved in oxidative phosphorylation. Cells in the body would not

operate without lipids, and the body would just fail. They're one of the most crucial macromolecules [4].

## Omega-3 Fatty Acids

Omega-3 fatty acids Eicosa Pentaenoic Acid (EPA) and Docosa Hexaenoic Acid (DHA) are present in marine fish, especially salmon, tuna, mackerel, herring, and sardines, as well as fish oil. These two fatty acids play a vital role in cell membrane formation. They've been demonstrated to have anti-inflammatory properties in the body. EPA and DHA diminish the expression of adhesion molecules involved in inflammation and may modify and limit the generation of prostaglandins and leukotriens from the n-6 fatty acid arachidonic acid [5]. These modifications are most likely caused by changes in lipid rafts on cell membranes, which impact signalling cascades and limit activation of the pro-inflammatory transcription factor NF- $\kappa$ B. EPA and DHA can boost the synthesis of protective mediators including resolvins, protectins, and maresins, as well as the anti-inflammatory cytokine IL-10.

## Micronutrients

Micronutrients are a category of nutrients that are necessary for the human body to conduct certain physiological activities effectively, but are normally consumed in little amounts.

## Vitamins and Minerals

Vitamins and minerals are necessary for the body to develop and operate properly. Your body need thirteen vitamins, but the gut microbiota produces Vitamin K and Vitamin D from sunshine. Vitamins are divided into two categories: fat-soluble vitamins and water-soluble vitamins [6]. Vitamins A, K, E, and D are fat-soluble vitamins, meaning they are soluble in organic solvents. Water-soluble vitamins include vitamin C and B vitamins (thiamine, riboflavin, niacin, pantothenic acid, biotin, vitamin B-6, vitamin B-12, and folate), which are soluble in water. With the exception of a small percentage of the population who do not acquire enough micronutrients from their food or have a health condition that impacts their nutritional needs, most of the key vitamins the body requires may be obtained through a well-balanced diet. Minerals, like vitamins, are required for your body to be healthy and function effectively. Minerals help your bones, muscles, heart, and brain to operate properly. Phosphorus, calcium, magnesium, sodium, potassium, chloride, and sulphur are minerals. Iron, manganese, copper, iodine, zinc, cobalt, fluoride, and selenium are all trace minerals that are required in lesser amounts [7].

## Phytochemicals

Chemical substances present in plants are known as phytochemicals. Phytochemicals can be found in a variety of foods, including fruits, vegetables, whole grains, seeds, nuts, and legumes. They provide a wide range of health advantages, from minor ones like decreasing blood pressure, reducing inflammation, and lowering LDL cholesterol levels in the blood

to important ones like preventing tumour growth, cancer, and cardiovascular disease, as well as boosting the immune system [8].

## Antioxidants

Antioxidants are substances that prevent a molecule or atom from becoming a free radical by blocking unpaired electrons. Free radicals are molecules that are produced naturally in the human body after physical activity or as a result of exposure to environmental factors such as cigarette smoke, pollution, and sunlight. Oxidative stress is caused by destabilized free radicals that are extremely reactive. This oxidative stress is what generates responses in the body that can harm cells, causing them to lose function and become pathogenic [9].

## Polyphenols

Polyphenols are organic compounds that occur naturally in plants. Antioxidants having anti-inflammatory effects are significant antioxidants. Curcumin has been shown to influence immunity in a variety of ways, most notably through the regulation and inhibition of transcription factors such as nuclear factor NF- $\kappa$ B and activator protein 1(AP-1). Resveratrol, another polyphenol, similarly modifies and increases immune response [10].

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