
Macronutrients and the Immune System: A Vital Connection
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Introduction

This presentation centers on the critical role of macronutrients, including carbohydrates, proteins, and fats, in shaping immune function and overall health.

It emphasizes that a balanced diet, rich in these macronutrients, is paramount for nurturing a strong and effective immune system, as it provides the necessary building blocks and energy for immune cells and responses.

The Importance of Nutrition

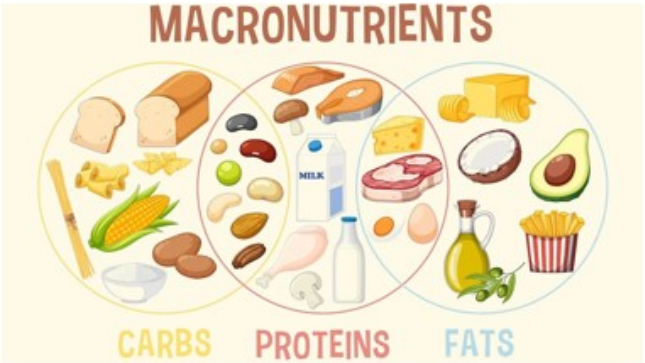
Nutrition significantly influences immune health, providing essential nutrients that support immune cell function and responses.

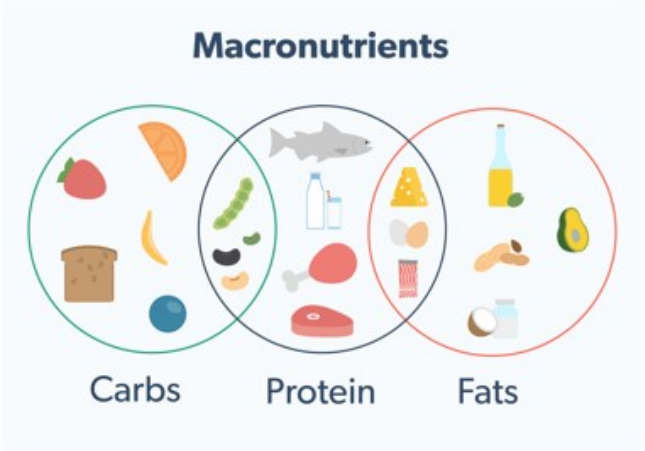
A well-balanced diet, comprising a diverse range of nutrient-rich foods, is imperative for sustaining optimal immune function and enhancing resilience against infections.

Macronutrients Defined

Macronutrients are essential nutrients required in relatively large quantities by the body, with carbohydrates serving as the primary source of energy, proteins playing a crucial role in tissue repair and immune function, and fats serving as an energy reserve and facilitating nutrient absorption.

Carbohydrates provide the body with readily available energy, while proteins are the building blocks of cells, enzymes, and antibodies, and fats aid in the absorption of fat-soluble vitamins and serve as a long-term energy source.

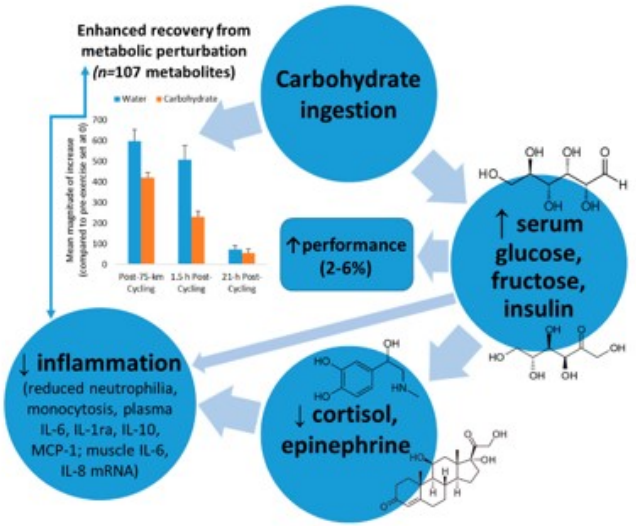




Carbohydrates and Immunity

Carbohydrates are essential for providing energy to immune cells, enabling them to detect and respond to pathogens effectively.

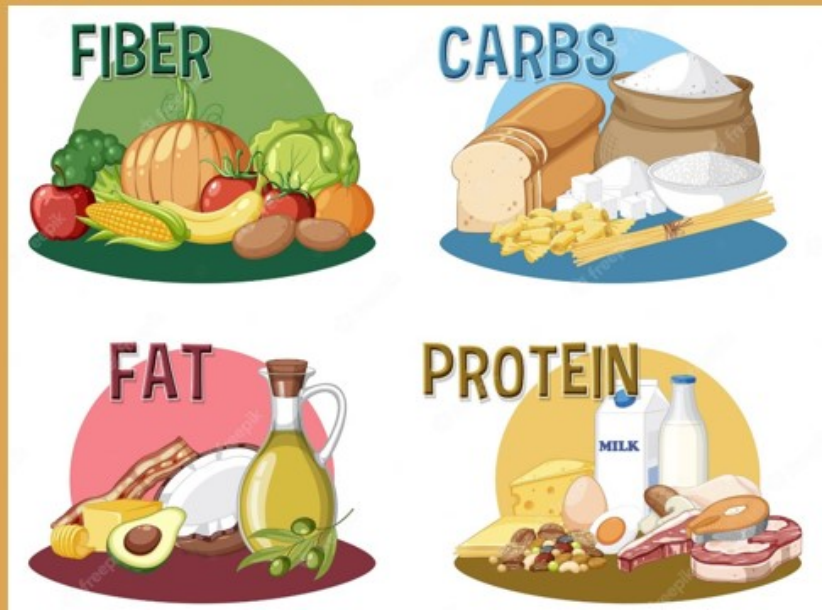
Healthy carbohydrate sources encompass whole grains, fruits, vegetables, and legumes, offering sustained energy release and crucial nutrients that bolster immune function.



Carbohydrates: Fiber and Immunity

Dietary fiber plays a crucial role in supporting gut health and the immune system by nourishing beneficial gut bacteria, improving digestion, and reducing inflammation.

Fiber-rich foods, including whole grains, legumes, fruits, vegetables, and nuts, provide not only dietary fiber but also a wealth of vitamins, minerals, and antioxidants that contribute to overall well-being.



Fats and Immune Response

Fats, or lipids, have a dual role in immune function, serving as energy stores and impacting inflammation. Healthy fats, like omega-3 fatty acids from sources such as fatty fish and flaxseeds, possess anti-inflammatory properties and support immune regulation, while saturated and trans fats can promote inflammation and hinder immune responses.

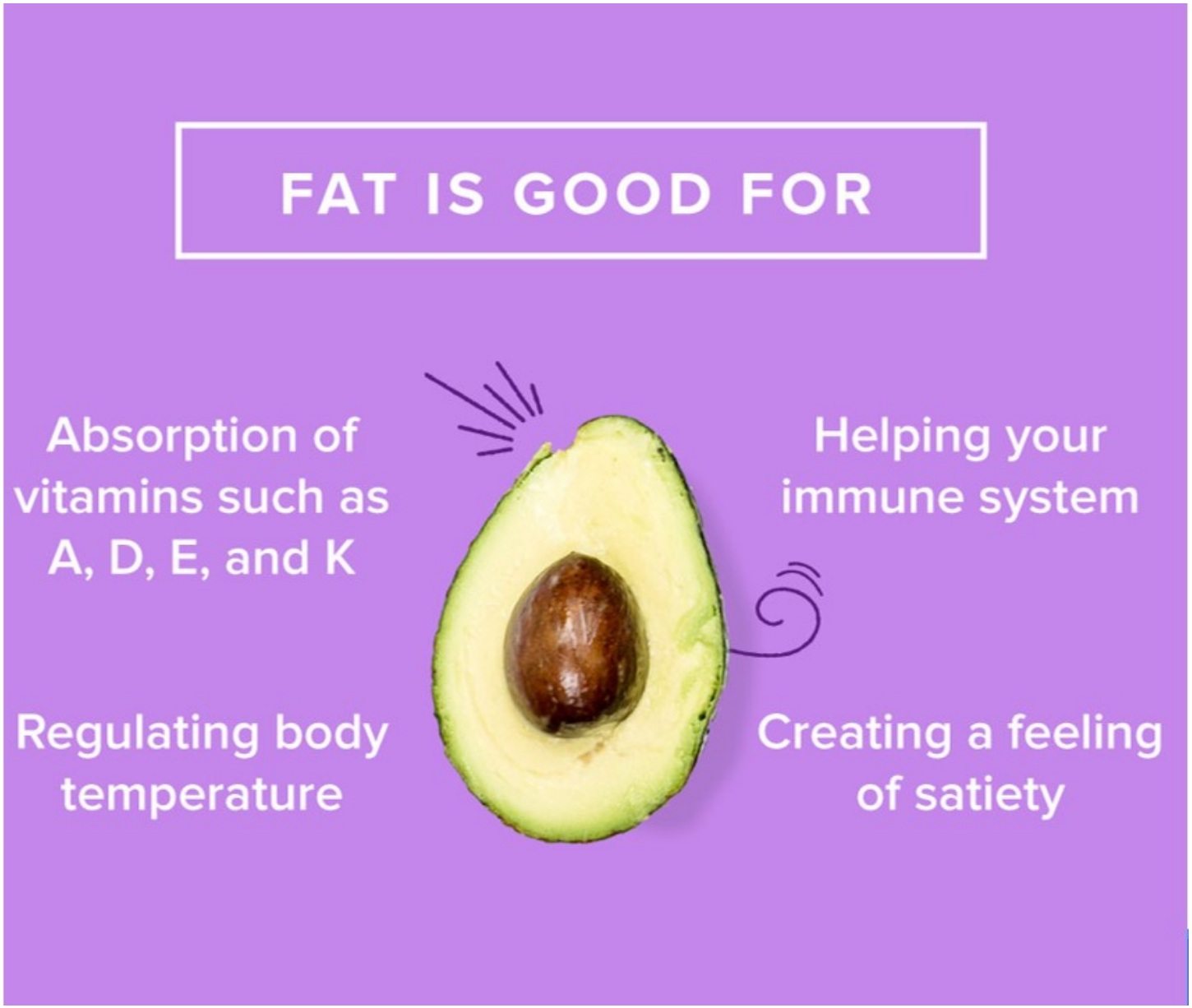
Omega-3 fatty acids, in particular, are recognized for their immunomodulatory effects, influencing the production of inflammatory molecules and enhancing immune cell function.

Healthy Fats and Immune Balance

Healthy fats, notably present in avocados, nuts, seeds, and olive oil, supply essential fatty acids crucial for immune cell membrane integrity and function.

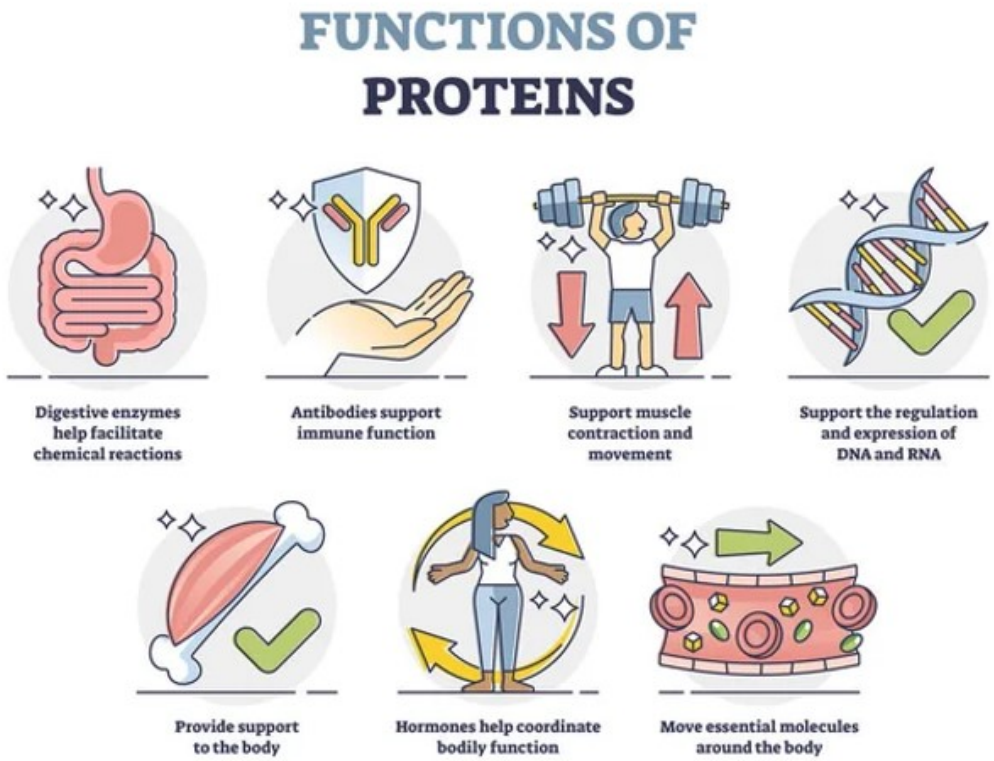
These fats (Omega 3 Fatty acids) also contribute to immune balance by modulating the production of anti-inflammatory molecules, facilitating targeted pathogen responses, and preventing excessive inflammation.

Understanding the distinction between healthy and unhealthy fats underscores the importance of integrating sources of beneficial lipids into one's diet to maintain an anti-inflammatory environment and promote a well-functioning immune system.




6 SOURCES OF
Healthy Fats
(& THEIR HEALTH BENEFITS)
AVOCADO
• OLEIC ACID
• DIEATARY FIBER
• LUTEIN
• POTASSIUM
FISH
• OMEGA-3 FATTY ACIDS
• CALCIUM
NUTS
• CALCIUM
• ANTI-INFLAMMATORY
• GOOD FOR YOUR HEART
CHIA SEEDS
• VITAMIN E
• VITAMIN K
• GOOD FOR YOUR HEART
• LOWERS LDL CHOLESTEROL
EVOO
• REDUCE BLOOD PRESSURE
• OMEGA-3 FATTY ACIDS
• CALCIUM
WHOLE EGGS
• NECESSARY CHOLESTEROL
• WEIGHT LOSS
• INSULIN SENSITIVITY

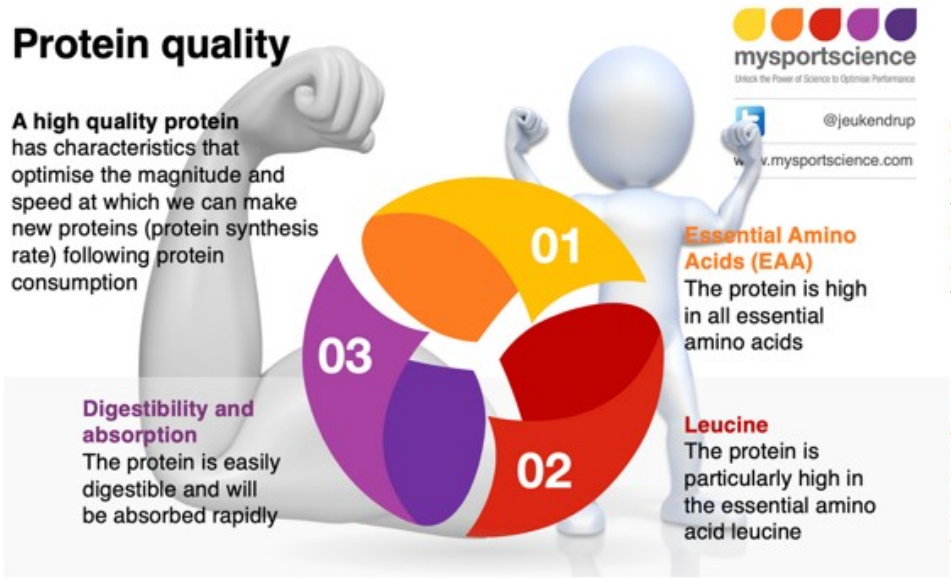

What is a healthy fat?
Olive/Vegetable Oil
Avocado
Peanut Butter
Flaxseed
Nuts & Seeds
Fatty Fish



Proteins and Immune Function

Proteins are essential for immune cell and antibody production, forming the foundation of immune responses against pathogens.

Prioritizing lean protein sources like poultry, fish, legumes, and tofu is crucial, as they provide high-quality protein without excessive saturated fats, supporting both overall health and immune function.



Protein Quality and Immunity

High-quality protein sources, including lean meats, fish, dairy products, and plant-based options, are crucial for providing essential amino acids, which are the structural components of proteins.

Amino acids, derived from dietary proteins, play a pivotal role in immune function by facilitating immune cell development, antibody synthesis, and immune signaling, thereby enhancing the body's ability to combat pathogens.

Macronutrients

Protein component of human milk

The proteins of human milk are divided into the whey and casein fractions or complexes, with each comprised by a remarkable array of specific proteins and peptides.

The most abundant proteins of are casein, α-lactalbumin, lactoferrin, secretory immunoglobulin IgA, lysozyme, and serum albumin.

Component of macronutrients in bovine colostrum vs mature milk

Component	BC	Mature Milk
Total solids (%)	24–28	12.9
Fat (%)	6–7	3.6–4.0
Protein (%)	14–16	3.1–3.2
Casein (%)	4.8	2.5–2.6
Albumin (%)	6.0	0.4–0.5
Total immunoglobulin (mg/mL)	42–90	0.4–0.9
Lactose (%)	2–3	4.7–5.0

Ref: Playford RJ, Weiser MJ. Bovine Colostrum: Its Constituents and Uses. Nutrients. 2021 Jan 18;13(1):265

Lactoferrin

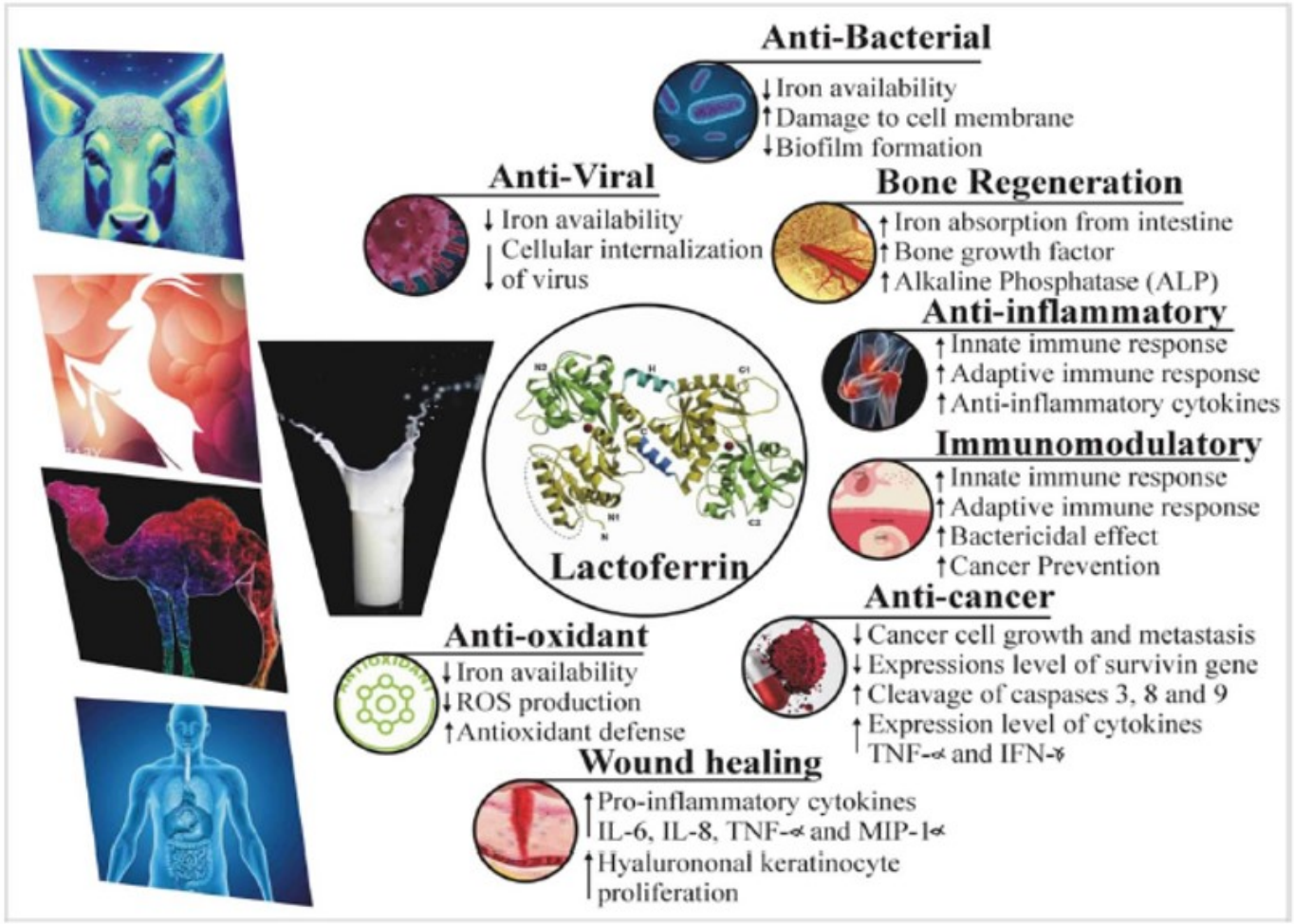
Lactoferrin is a key constituent of innate immune function that leads to the activation of the adaptive immune system.

Lactoferrin is present in high concentrations in breast milk, especially in colostrum.

Lactoferrin helps with regulation of cell growth and differentiation and has antioxidant properties.

Therapeutic effects of Lactoferrin

Fig. 2 A schematic diagram illustrating various therapeutic effects of lactoferrin and underlying mechanism of action [27, 50–55]



Ref : M. F. Ashraf et al. Nutraceutical and Health-Promoting Potential of Lactoferrin, an Iron-Binding Protein in Human and Animal: Current Knowledge, 2023

Sources and concentration of lactoferrin in different types of colostrum, milk and secretions

Milk type	Lactoferrin concentration (mg/mL)
Human colostrum	5.80
Bovine colostrum	0.82
Camel colostrum	0.81
Goat colostrum	0.39
Human milk	2–3
Bovine milk	0.1–1.5
Goat milk	0.2–2.2
Sheep milk	0.5–2.5
Buffalo milk	1.2–2.0
Camel milk	0.4–3.3
Human tears	1.13

Source of lactoferrin	Action	Biological effects
Human lactoferrin (hLf)	Antimicrobial	↓ The growth of *Streptococcus*, *Salmonella*, *Shigella*, *Staphylococcus*, and *Enterobacter* ↑ Bacterial death
	Anti-inflammatory	↑ Immune status and anti-inflammatory cytokines ↓ Pro-inflammatory response in monocyte derived macrophages
	Immunomodulation	↓ The formation of neutrophil extracellular traps
Bovine lactoferrin (bLf)	Anticancer	↑ Anticancer activities against colorectal cancer and lung cancer
	Anti-microbial	Effective against oral candidiasis, influenza virus pneumonia, and skin infections due to herpes virus
	Immunomodulation	↑ Host immune response ↓ Inflammatory process and pro-inflammatory cytokines production

Ref : M. F. Ashraf et al. Nutraceutical and Health-Promoting Potential of Lactoferrin, an Iron-Binding Protein in Human and Animal: Current Knowledge, 2023

The Therapeutic potential of lactoferrin to COVID-19

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Lactoferrin for COVID-19 prevention, treatment, and recovery

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Bovine lactoferrin for the prevention of COVID-19 infection in health care personnel: a double-blinded randomized clinical trial (LF-COVID)

Rafaella Navarro · Jose Luis Paredes · Lourdes Tucto · Carlos Medina · Eddie Angles-Yanqui · Juan Carlos Nario · Jorge Ruiz-Cabrejos · Juan Luis Quintana · Kevin Turpo-Espinoza · Fernando Mejia-Cordero · Meylin Aphang-Lam · Jorge Florez · Gabriel Carrasco-Escobar · Theresa Jean Ochoa

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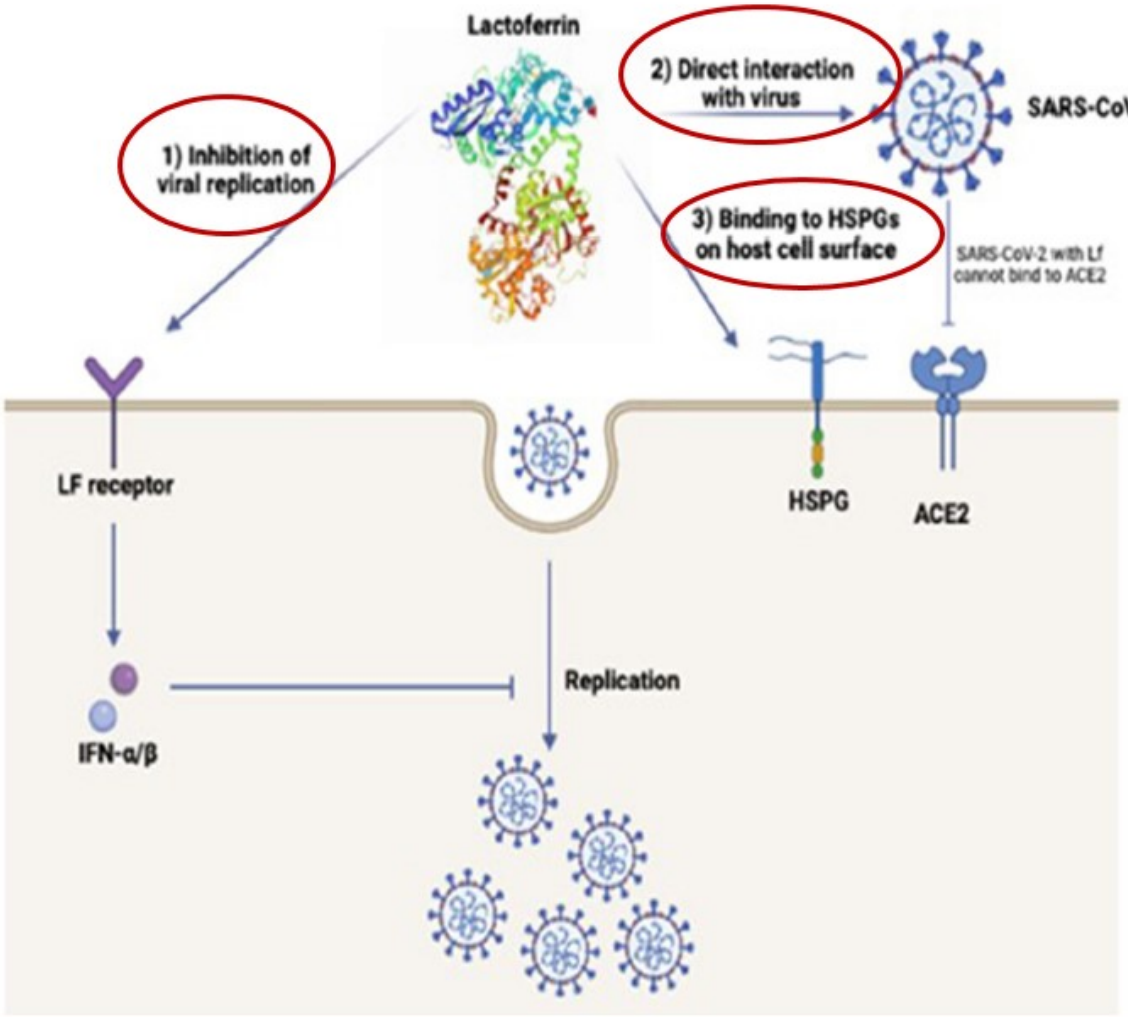


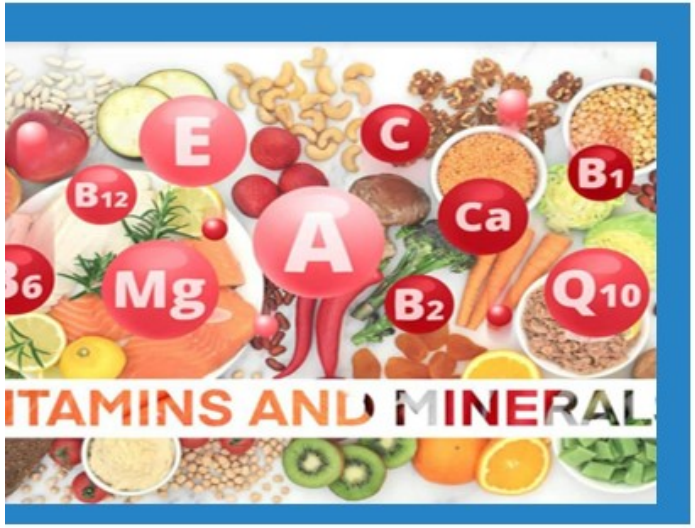
Potential mechanisms of lactoferrin antiviral mechanism against SARS-CoV-2;

(1) Inhibition of viral replication *via* the induced a and b IFN by direct binding of lactoferrin to its cell receptor,

(2) Direct interaction of lactoferrin with SARS-CoV-2 prevents the binding of the virus to ACE2 receptor,

(3) Binding of lactoferrin to heparan sulfate proteoglycans (HSPGs) on the host cell surface which prevents the viral entry through the host cell.

Ref : Bolat E, Eker F, Kaplan M, Duman H, Arslan A, Saritaş S, Şahutoğlu AS, Karav S. Lactoferrin for COVID-19 prevention, treatment, and recovery. Front Nutr. 2022 Nov 7



Vitamins and Minerals

Micronutrients like vitamin C, vitamin D, zinc, and iron actively support immune responses by enhancing immune cell activity, regulatory functions, and antibody production.

Understanding the intricate relationship between macronutrients and these micronutrients underscores the critical role of a well-balanced diet in ensuring the availability of vital vitamins and minerals essential for a robust immune system.

Hydration and Immune Health

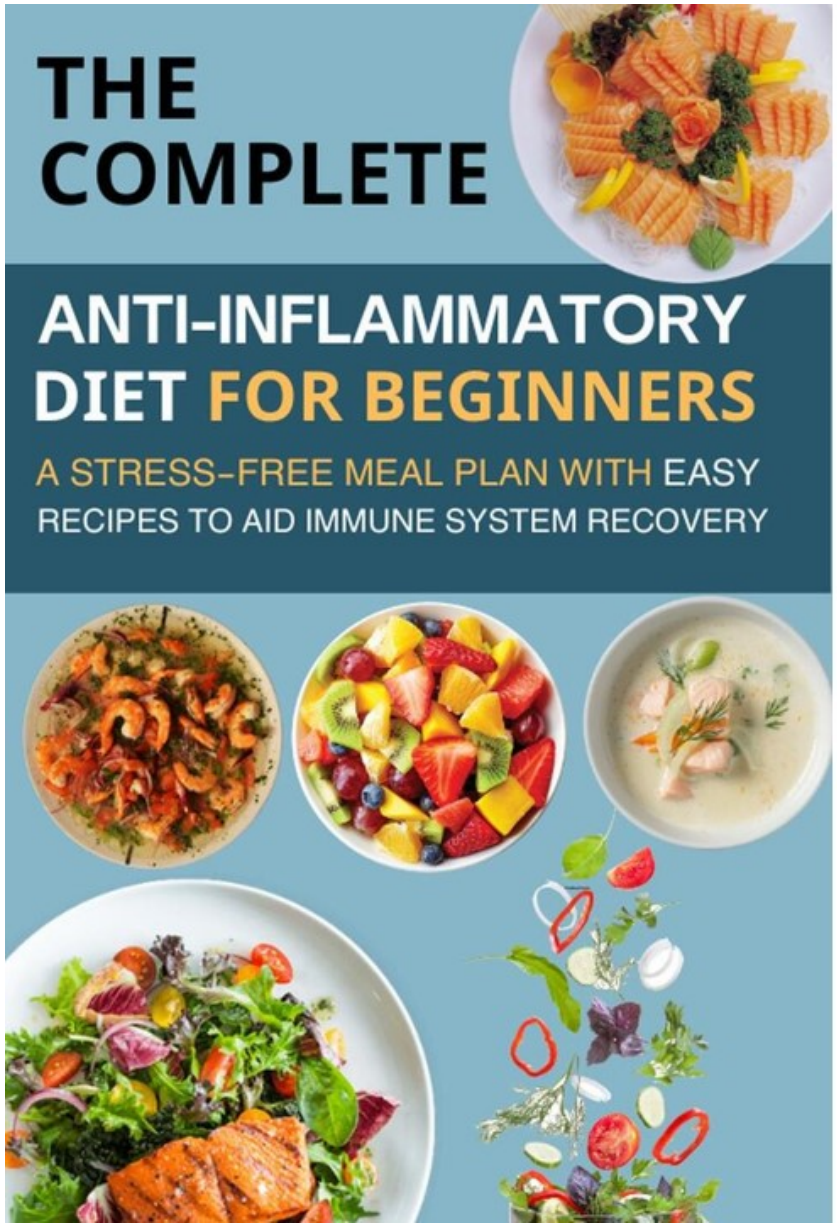
Adequate hydration is essential for overall health and immune function, as it supports the efficient circulation of immune cells throughout the body.

Water plays a critical role in transporting essential nutrients, including those vital for immune responses, to cells, optimizing immune function.

Macronutrients and Inflammation

Dietary choices can modulate inflammation levels, with nutrients like antioxidants and omega-3 fatty acids mitigating inflammation, while a diet rich in processed foods and unhealthy fats can exacerbate it.

Chronic inflammation, exacerbated by poor dietary habits, is intricately linked to immune-related disorders, including autoimmune conditions and allergies, impacting the balance and efficacy of the immune system.



Meal Planning for Immune Support

Optimal meal planning for immune health involves prioritizing a nutrient-dense diet comprised of diverse fruits, vegetables, lean proteins, whole grains, and healthy fats to provide essential immune-supporting nutrients.

Emphasizing dietary variety, hydration, and reducing processed and sugary foods is integral for maintaining a resilient immune system and overall well-being.

Immune-Boosting Recipes

Immune-boosting meal examples include vegetable stir-fry with tofu or quinoa salad with chickpeas, both rich in macronutrients.

Consistently incorporating these macronutrient-rich foods supports balanced nutrition and immune health.

Special Dietary Needs

Tailoring diets for health conditions or dietary restrictions is crucial for meeting individual nutritional needs.

Nutrition is instrumental in managing immune-related diseases, offering potential relief from symptoms and bolstering immune function.

Special Considerations

Do you have any dietary restrictions?

Dietary restrictions MUST be indicated here to receive a personalized meal ticket for all food functions. To ensure your safety, special requests will not be provided at meal functions without a meal ticket.

- ☐ Vegetarian (Vg)
- ☐ Vegan (V)
- ☐ Halal (H)
- ☐ Kosher (K)
- ☐ Gluten-free (GF)
- ☐ Food Allergy
- ☐ Other_____
- ☐ None

A traditional meal includes steamed white rice as the main dish accompanied by Burmese curries, a light soup or consommé, and other side dishes, including fried vegetables, Burmese fritters, and ngapi yay gyo (ငါးပိရည်ကျို), a plate of fresh and blanched vegetables served with pickled fish dip.

Eating Habit of Myanmar elderly

Table 7.5 Frequency that various types of food were eaten by persons aged 60 and older during prior week, Myanmar 2012

	Frequency food was eaten in past week			
	Daily/ almost daily	Some days	Not at all	Total
Rice, noodles, bread, corn or grains	92%	7%	1%	100
Vegetables	46%	52%	2%	100
Sweets, jaggery or soft drinks	19%	60%	21%	100
Beans, pulses, dhal	17%	68%	16%	100
Fruit	11%	72%	17%	100
Fish or crabs	9%	81%	10%	100
Milk or milk products	9%	35%	56%	100
Nuts or tofu	5%	51%	44%	100
Meat	4%	77%	19%	100
Eggs	2%	77%	21%	100
Roots, tubers, potatoes, taro, arrowroot	1%	72%	27%	100

Source: 2012 Survey of Older Persons in Myanmar

Eating the right foods helps you feel healthy and strong. While you may already pay attention to what you take into your body.

"When a man is always mindful, knowing moderation in eating,
his discomfort diminishes, and he ages slowly, taking care of his life."
Buddha to King Pasenadi of Kosala (From *The King of the Forest: Teaching of the Buddha to King Pasenadi Kosala*)

Dhammapada verse 204: Health is the greatest blessing.

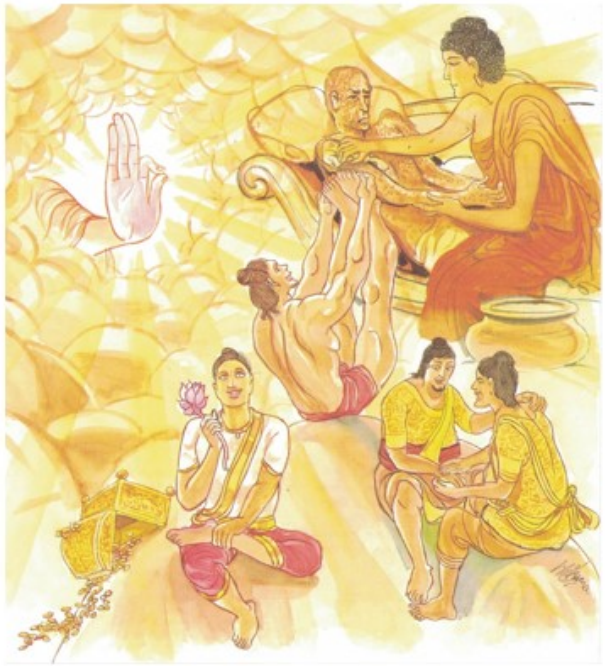
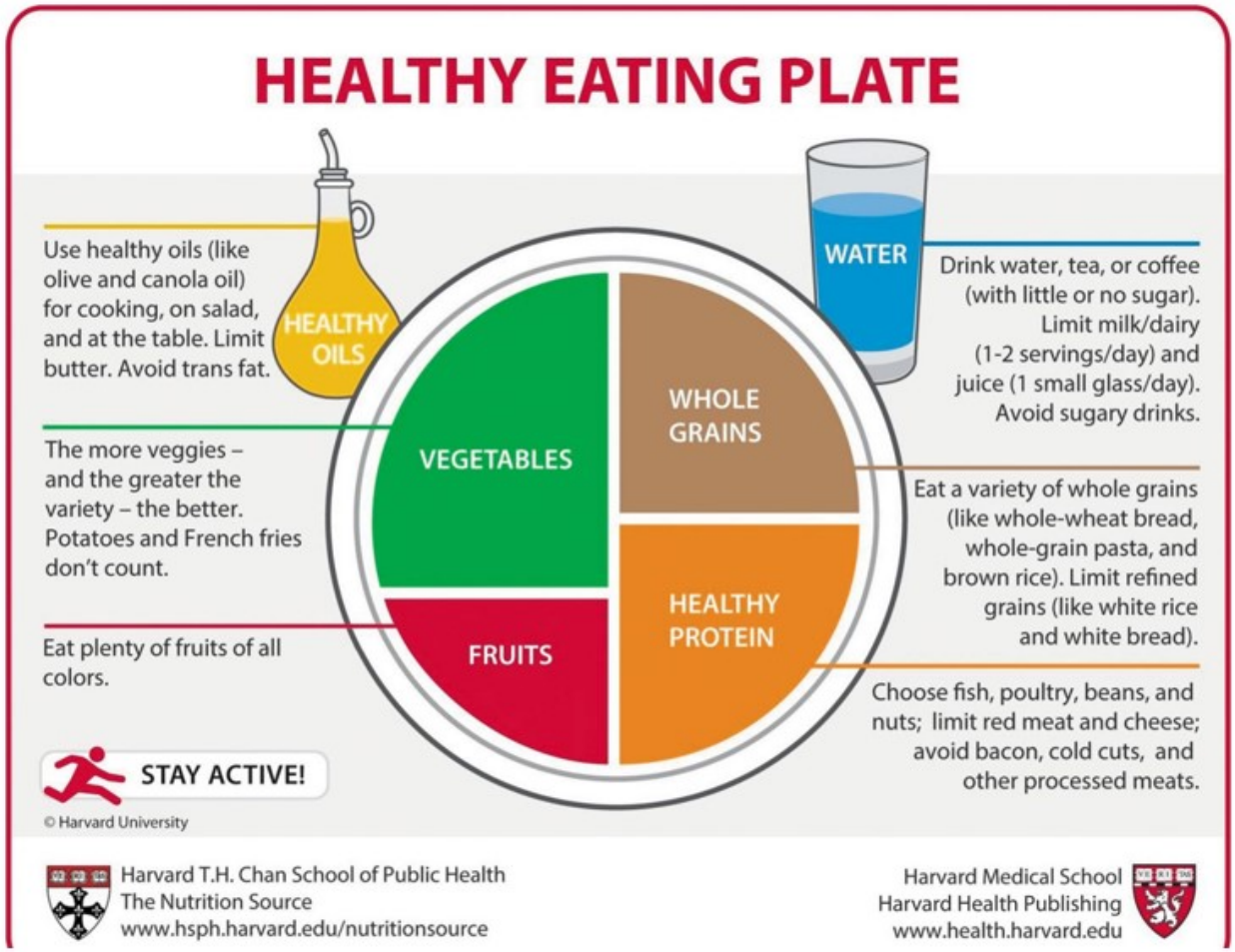


Illustration of Dhammapada Verse 204
"Good Health is the greatest blessing.
Contentment is the best wealth.
Nibanna is the highest bliss."

- Comprises of 5 different food groups



Conclusion

Macronutrients are integral to immune function, emphasizing the necessity of a balanced diet.

Recognizing this relationship underscores the vital role of dietary choices in immune system resilience.

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THANK YOU