

IMMUNOMODULATORY EFFECTS OF FOODS

Essay

**Submitted for partial fulfillment of Master Degree
in Pediatrics**

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1999**

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2010

تطوير المناعة بالغذاء

مقالة

توطئه للحصول على درجة الماجستير
فى طب الأطفال

مقدمة من

الطبيب /إسلام مسعود سليمان

بكالوريوس الطب والجراحة 1999

كلية الطب – جامعة الأزهر

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2010

ACKNOWLEDGEMENT

*First and foremost, thanks and praise to Allah,
most gracious, most merciful.*

I wish to express my deepest appreciation and respect for [Dr: Yehia Mohammed El-Gamal](#), Professor of Pediatrics, Faculty of Medicine, Ain Shams University, for his valuable guidance, kind advice and useful help through out this work.

Also I wish to express my sincere thanks and deepest gratitude to [Dr Ola Abd Elaziz Elmasry](#) Assistant Professor of Pediatrics, Faculty of Medicine, Ain Shams University, for her generous encouragement, and continuous supervision during this work.

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List of abbreviations

ABL	Agarius Bisporus Lectin
AE	Acrodermatitis Enteropathica
AIDS	Acquired Immune Deficiency Syndrome
ALRI	Acute Lower Respiratory Infection
APAL	Apalbumin
APAL-F1	Recombinant Apal Fragment-1
APC	Antigen Presenting Cells
APP	Auricularia Polytricha Protein
CAMP	Cyclic Adenosine Monophosphate
CAT-2	Catalase 2
CD	Cluster Of Differentiation
CLA	Conjugated Linoleic Acid
CON-A	Concanavalin A
COX	Cyclo-oxygenase
CRC	Colo Rectal Carcinoma
CRP	C- Reactive Protein
CTL	Cytotoxic T Lymphocyte
CVs	Cruciferous Vegetables
Da	Dalton
DBPCFC	Double- Blind Placebo – Controlled Food Challenge
DGLA	Dihomo-Gamma-Linolenic Acid
DHA	Docosahexaenoid Acid
DNA	Deoxy Ribonucleic Acid
DSS	Dextran Sulphate Sodium
DTH	Delayed Type Hypersensitivity
DTQ	Dithymaquinone



ECP	Eosinophil Cationic Protein
EE	Eosinophilic Esophagitis
EGIDS	Eosinophilic Gastrointestinal Disorders
EPA	Eicosapentaenoic Acid
EPX	Eosinophil Protein X
FIEA	Fluorescent Enzyme Immuno-Assay
FPIES	Food Protein- Induced Enterocolitis Syndrome
GAIT	Gut Associated Lymphoid Tissue
GAPDH	Gamma Amino Puteric Dehydrogenase
GI	Gastro-intestinal
GIT	Gastro-intestinal Tract
GM-CSF	Granulocyte Macrophage Colony Stimulating Factor
GSH	Glutathione
GT	Glutathione Transferase
HETE	Hydroxy Eicosa Tetra Enoic Acid
HIF	Hypoxia Inducible Factor
HIV	Human Immunodeficiency Virus
HLA	Human Leukocytic Antigen
IBD	Inflammatory Bowel Disease
IEL	Intra Epithelial Lymphocytes
Ig	Immunoglobulin
IKBA	Inhibitor Of Kappa B Alpha
IKK	Inhibitor Of Kappa B Kinase
IL	Interleukin
INOS	Inducible Nitric Oxide Synthase
IP ₁₀	Interferon Gamma Inducible Protein Of 10 KD
ITAC	Inducible T-Cell A Chemoattractant



KD	Kilo Dalton
LA	Linoleic Acid
LAB	Lactic Acid Bacteria
LDH	Lactate Dehydrogenase
LOX	Lipo-Oxygenase
LPS	Lipopolysaccharide
LT	Leukotriens
MDP	Muramyl Dipeptide
MHC	Major Histocompatibility Complex
MIG	Monokine Induced By INF-Gamma
NFKB	Nuclear Factor Kappa B
NK	Natural Killer
NO	Nitric Oxide
NS	Nigella Sativa
PBMC	Peripheral Blood Mononuclear Cells
PG	Prostaglandin
PHA	Phytohemagglutinin
PKA	Protein Kinase A
PMN	Peripheral Mononuclear Cells
RAE	Retinol Activity Equivalents
RASTS	Radio-allergo-sorbant Tests
RCT	Randomized Controlled Trial
RDA	Recommended Dietary Allowance
RE	Retinol Equivalent
RJ	Royal Jelly
RNA	Ribonucleic Acid
ROS	Reactive Oxygen Species
RPA	RNA Protection Assay
SCID	Severe Combined Immune Deficiency
SCORAD	Scoring of Atopic Dermatitis



SIgA	Secretory Immunoglobulin A
STZ	Streptozatocin
TGF	Transforming Growth Factor
Th	T helper
TLR	Toll – Like Receptor
TNFA	Tumor Necrosis Factor Alpha
TQ	Thymoquinine
TX	Thromboxane
UL	Upper Intake Level
UV	Ultra Violet
VCAM	Vascular Cell Adhesion Molecule
Zn	Zinc



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INTRODUCTION

Many fundamental principles in nutritional immunology have emerged over the years and provide the basis for analysis of antioxidant nutrition and immunity. These include the following:

1. Nutrition can affect innate immunity such as barriers to infection, mucosal surfaces, complement, natural killer (NK) and polymorphonuclear cell functions.

2. Nutrients can also effect a decrease or increase and therefore imbalance, in the ratio of T- to B-cells, their subsets, e.g., $CD4^+$ to $CD8^+$ ratio, lymphoproliferation, cytokine balance, and antibody production and function.

3. Lymphoid tissues and cells are particularly vulnerable to environmental (e.g., nutritional) insult during fetal and neonatal growth and differentiation (vulnerable period), which can have short-term- as well as long-term-consequences.

4. Pathological nutritional deficits can impact the immune response in both developed and developing countries. For example, infection can induce similar immunological changes to that observed under different nutritional states, and can induce metabolic effects on nutritional status, e.g., the

effect of measles on vitamin A, Epstein-Barr virus infection (and HIV) on essential fatty acid status.

5. The nutrition-immunity-infection model has been classically considered a more-or-less "one way" model, but there is also evidence for reverse flow, that is, nutrients can affect genotype and virulence and possibly vertical transmission of pathogens. The nutrition-immunity-infection model is, therefore, more complex than originally thought (*Harbige and Gershwin, 2004*).

Protein – energy malnutrition in young children increased their susceptibility to common childhood illness such as diarrhea and acute respiratory infections which, in turn, increased their risk of being undernourished as a result of reduced food intake and increased losses from poor absorption and metabolism. Over the last 30 years, considerable progress has been made in understanding the mechanisms by which undernutrition – and more recently specific micronutrient deficiencies – can affect the immune system and thus the response to infections (*Ramakrishnan et al, 2004*).

Functional foods as a term is used to describe foods fortified with ingredients capable of producing health benefits. Probiotic products represent a strong growth area within the

functional foods group. Such probiotic foods, especially dairy products such as yogurts and fermented milks, may modulate gut microbial composition, thereby leading to improved gut health, for example, through improved tolerance to lactose in lactose – intolerant individuals or improved resistance to pathogenic bacteria (**Stanton et al, 2001**).

The interrelation of nutrients and skin, particularly the photoprotective effects of vitamins, carotenoids, and polyunsaturated fatty acids, is well known. Supplementation with these nutrients was shown to provide protection against ultraviolet light and influences cutaneous immune responses. Dietary consumption of certain plants or fish oil is known to modulate the balance of lipid inflammatory mediators and, therefore, is valuable in the treatment of inflammatory skin disorders (**Boelsma et al, 2001**).

AIM OF THE WORK

This essay reviewed selected types of foods, and micronutrients and their known functions in the complex immune system.