Effect of Probiotics Supplementation on Serum Level of Il1 and Il6 in Infants

Thesis

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List of Abbreviations

Abb.	Meaning
AAD	Antibiotic-associated diarrhea
ADAM	ADAM metallopeptidase domain
BALF	Bronchoalveolar lavage fluid
CLRs	C-type lectin receptors
DAMPs	Damage-associated molecular patterns
DC-SIGN	Dendritic Cell-Specific Intercellular adhesion molecule-3- Grabbing Non-integrin
ERK1/2	Extracellular signal-regulated kinase 1 and 2
FDA	Food and drug administration
GCR-alpha	Glucocorticoid receptor
G-CSF	Granulocyte-colony stimulating factor
GM-CSF	Granulocyte-macrophage colony stimulating factor
gp130	Glycoprotein 130
HIF-1-α	Hypoxia-inducible factor-1-α
IBD	Inflammatory bowel disease
ICAM1	Intercellular adhesion molecule 1
ICE	Interleukin converting enzyme
IFNγ	Interferon gamma
IL-1RAcP	Interleukin 1 receptor accessory protein
IL6RA	Interleukin 6 receptor alpha subunit
JAK1	Janus kinase 1

Abb.	Meaning
JAK2	Janus kinase 2
LCPs	Long-chain polyunsaturated fatty acids
LGG	Lactobacillus rhamnosus GG
LIF	Leukemia inhibitory factor
MCP1	Monocyte Chemotactic Protein 1
M-CSF	Macrophage- colony stimulating factor
MHC	Major histocompatability complex
NF-kB	Nuclear factor-kappa B
NK	Natural killer
NLRs	nucleotide- like receptors
NLS	Nuclear localization sequence
NOD	nucleotide -binding oligomerization domain
PAMPs	Pathogen-associated molecular patterns
PGE2	Prostaglandin E2
PRRs	Pattern recognition receptors
ROS	Reactive oxygen species
SAA	Serum amyloid A
SCID	Severe combined immunodeficiency
sIL-6R	Soluble interleukin 6 receptor
SOCS3	Suppressor of cytokine signaling 3
STAT3	Signal transducer and activator of transcription 3
TGF	Transforming growth factor

Abb.	Meaning
TIMP-1	Tissue inhibitor of metalloproteinases-1
TLR	Toll-like receptor
TNF	Tumor necrosis factor
Tyk2	Tyrosine kinase 2
VCAM1	Vascular cell adhesion molecule 1
VEGF	Vascular endothelial growth factor
ZO-1	Zona occludens-1

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Introduction

Probiotics are defined as non-pathogenic organisms that are incorporated into the diet to modify gut microbial ecology, leading to beneficial structural and functional changes in the gut. Probiotics serve as a barrier for the colonization of pathogens to prevent disease and the enhancement of the immune system. In addition, they carry out metabolic functions such as helping the fermentation of non-digestible fibers, and storing energy in the form of short-chain fatty acids. Of all the types of gut microbiota, Bifidobacteria and Lactobacilli are considered the two most essential bacteria beneficial to human health **(Penders et al., 2006)**. Yogurt, cheese, chocolate, and other fermented food are sources of probiotics **(Ljungh and Wadstrom, 2009; Sonomoto and Yokota, 2011)**.

Probiotics use distinct cellular and molecular mechanisms, including blocking pathogenic bacterial effects, regulating immune responses, and altering intestinal epithelial homeostasis by promoting cell survival, enhancing barrier function, and stimulating protective responses **(Vanderpool et al., 2008)**. Oral ingestion of Bifidobacteria and Lactobacilli can enhance innate immunity by increasing mucin production, competing and preventing the colonizing of pathogens, reducing gut permeability and helps activate macrophage

production, phagocytosis and NK cell activity .Also can enhance adaptive immunity by enhancing humoral immunity, increasing total and specific secretory IgA in serum and intestinal lumen and shaping of inflammatory gut immune responses **(Saavedra and Jose, 2007)**.

Interleukin-1 alpha and interleukin-1 beta are cytokines that participate in the regulation of immune responses, inflammatory reactions, and hematopoiesis **(Sims et al., 1988)**. Interleukin 1 is responsible for the production of inflammation, as well as the promotion of fever and sepsis. IL-1α is produced mainly by activated macrophages**,** as well as neutrophils, epithelial cells, and endothelial cells. It possesses metabolic, physiological, haematopoietic activities, and plays one of the central roles in the regulation of the immune responses. It binds to the interleukin-1 receptor **(Bankers-Fulbright et al., 1996; Dinarello, 1997)**.

Interleukin 1 beta (IL-1β) is a potent mediator in response to infection and injury **(Dinarello, 1998).** It is produced mainly by blood monocytes, but also by macrophages, dendritic cells and a variety of other cells in the body **(Dinarello, 1996)**.

IL-6 acts as both a pro-inflammatory and anti-inflammatory cytokine. It is secreted by T cells and

macrophages to stimulate immune response **(van der Poll et al., 1997)**. It is one of the most important mediators of fever and of the acute phase response. And is capable of crossing the blood brain barrier and initiating synthesis of PGE2 in the hypothalamus, thereby changing the body's temperature setpoint **(Banks et al., 1994)**.

Aim of the Work

The aim of this study is to determine the effect of feeding a probiotics supplemented formula on serum levels of IL1 and IL6 in infants in comparison to BF and those infants fed standard formula.